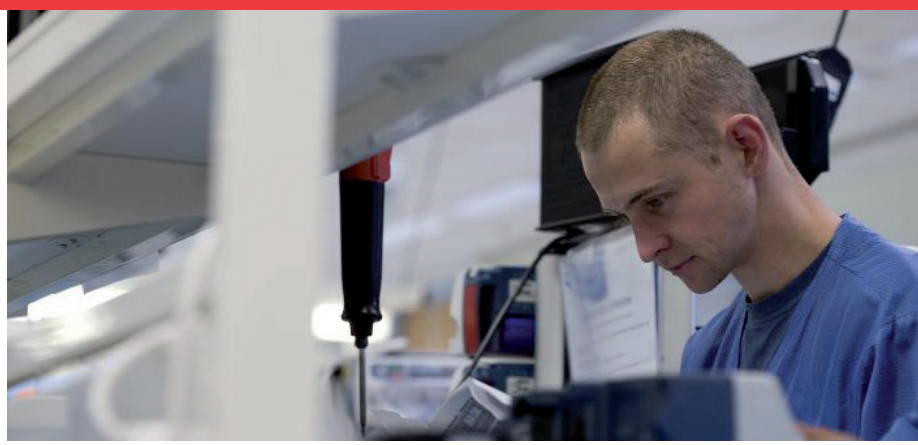
Alaris® Syringe Pumps

Technical Service Manual



CardinalHealth

This manual has been prepared for use by qualified service personnel only. Cardinal Health cannot accept any liability for any breakdown or deterioration in performance of parts or equipment resulting from unauthorised repair or modification.

Cardinal Health, 1180 Rolle, Switzerland

CE
0086

Alaris®, Guardrails® and Asena® are registered trademarks of Cardinal Health, Inc. or one of its subsidiaries. All other trademarks belong to their respective owners.

© 2002-2007. Cardinal Health, Inc. or one of its subsidiaries. All rights reserved.

Contents

Chapter

1. General Information 4

2. Configuration & Calibration 9

3. Routine Maintenance 21

4. Troubleshooting 30

5. Circuit Descriptions 37

6. Spare Part Replacement Procedures 40

Appendix

A. Specifications 62

B. Disposal 69

C. Spare Parts Listing 71

D. Fitting & Replacement Guidelines 76

E. Configuration & Drug Protocol Records 79

F. Service Contacts 86

G. Document History 88

Chapter 1

General Information

In this chapter

Introduction	5
General precautions	5
Front panel and main display	6
Controls and indicators	6
Loading a syringe	7
Starting the pump	8
Basic features	8

Introduction

The Alaris® Syringe Pumps are designed to deliver a continuous and accurate infusion whenever small fluid volumes need to be administered with great precision. High performance, comprehensive alarm protection and sophisticated monitoring systems combined with simple operation make these syringe pumps suitable for both general and critical infusions in a variety of areas within a hospital.
The Asena® brand name has been recently changed to the Alaris® brand name. This change in brand name has no effect on the intended use or functionality of the product. Recommended disposable products for use with this product may refer to either the Asena® brand name or Alaris® brand name and both types are suitable for use with this infusion pump.

Familiarity
Ensure that you are fully familiar with this syringe pump by carefully studying the Directions for Use (DFU) prior to attempting any repairs or servicing.
As part of a policy of continuous improvement, product enhancements and changes are introduced from time to time.

Purpose
This Technical Service Manual shows how to set up, test and maintain the following Alaris® Syringe Pump models:

- Alaris® GH Syringe Pump
- Alaris® CC Syringe Pump
- Alaris® PK Syringe Pump
- Alaris® GS Syringe Pump
- Alaris® GH Syringe Pump with Guardrails® Safety Software
- Alaris® CC Syringe Pump with Guardrails® Safety Software
- Alaris® TIVA Syringe Pump

It is intended for use by personnel experienced in medical equipment testing and maintenance procedures.

Symbols

Wherever you see this symbol in the manual you will find a Hints & Tips note that we hope you will find useful. These notes provide useful advice or information that may help you perform the task more effectively.

Wherever you see this symbol in the manual you will find a Toolbox note that highlights an aspect of test or maintenance that is important for you to know about. A typical example is a software upgrade that you should check has been installed.

General precautions

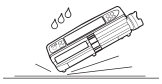
Please read the general Operating Precautions described in the Directions for Use carefully prior to using the pump.

This pump contains static-sensitive components. Observe strict precautions for the protection of static sensitive components when attempting to repair and service the pump.

An explosion hazard exists if the pump is used in the presence of flammable anaesthetics. Exercise care to locate the pump away from any such hazardous sources.

An electrical shock hazard exists if the pumps casing is opened or removed. Refer all servicing to qualified service personnel.

This pump is protected against the effects of high energy radio frequency emissions and is designed to fail safe if extremely high levels of interference are encountered. Should false alarm conditions be encountered, either remove the source of the interference or regulate the infusion by another appropriate means.

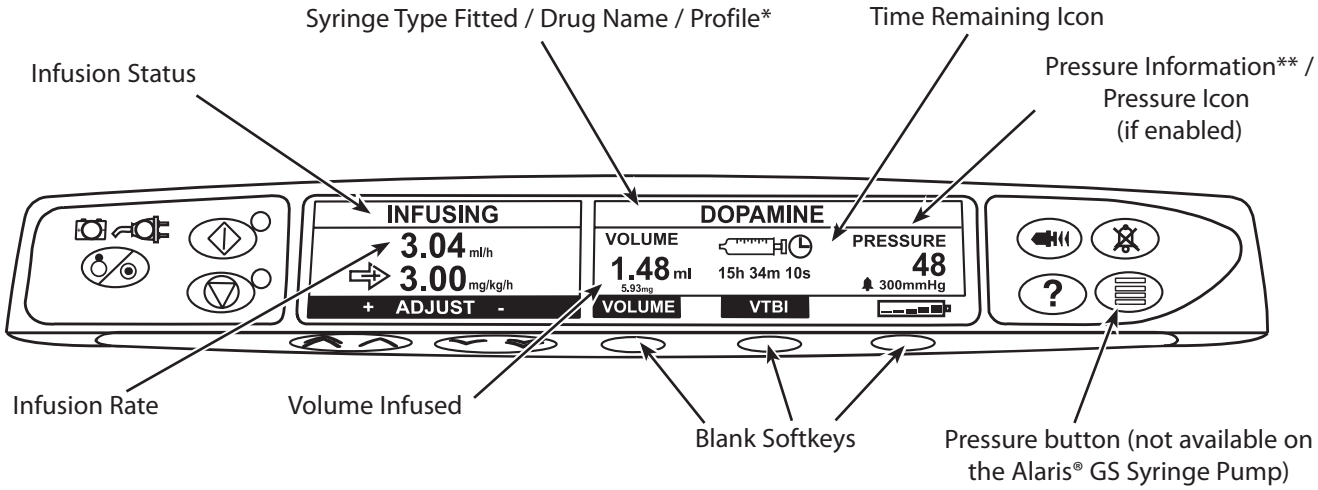


If the pump is dropped, subjected to excessive moisture, humidity or high temperature, or otherwise suspected to have been damaged, remove it from service for inspection by qualified service personnel.

When connected to an external power source, a three-wire (Live, Neutral, Earth) supply must be used. If the integrity of the external protective conductor in the installation or its arrangement is in doubt, the pump should be operated from the battery.

Front panel and main display

The display shown is for general guidance only. For pump specific front panel and main display information refer to relevant Directions For Use.



* "Profile" is only available on an Alaris® Syringe Pump with Guardrails® Safety Software with a Data Set loaded.
** Pressure Information is only displayed on the Alaris® CC Syringe Pump.

Controls and indicators

ON/OFF button - Press once to switch the pump ON. Press and hold down for 3 seconds to switch the pump OFF.

RUN button - Press to start the infusion. The Green LED will flash during infusion.

HOLD button - Press to put the infusion on hold. The amber LED will be lit while on hold.

MUTE button - Press to silence alarms.

PURGE/BOLUS button - Press to access **PURGE** or **BOLUS** soft keys. Press and hold down soft key to operate.

PURGE the extension set during set up.

- Pump is on hold
- Extension set is not connected to the patient
- Volume Infused (VI) is not added

BOLUS fluid or drug delivered at an accelerated rate.

- Pump is infusing
- Extension set is connected to the patient
- VI is added

OPTION button - Press to access optional features.

PRESSURE button - Press to display the pumping pressure and alarm level.

BLANK SOFTKEYS - Use in conjunction with the prompts shown on the display.

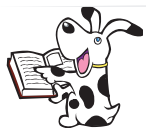
CHEVRON keys - Double or single for faster/slower, increase or decrease of values shown on main display.

BATTERY indicator - When illuminated, indicates that the pump is running on the internal battery. When flashing, indicates that the battery power is low, with less than 30 minutes of use remaining.

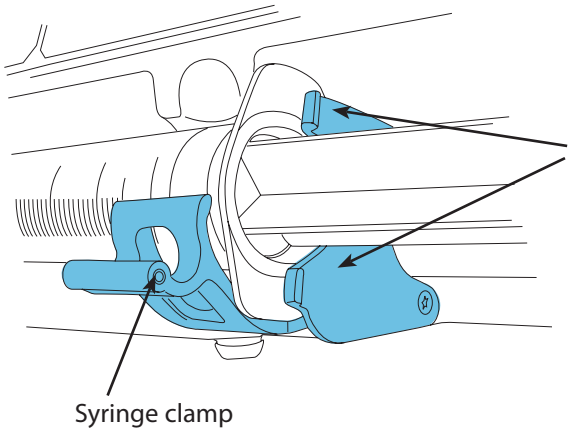
AC POWER indicator - When illuminated, indicates that the pump is connected to an AC power supply and the battery is being charged.

Loading a syringe

1. Squeeze the finger grips together on the plunger holder and slide the mechanism to the right. Pull the syringe clamp forward and down.
2. Place the syringe barrel flange in the slot between the two blue sections of the syringe flange clamp.

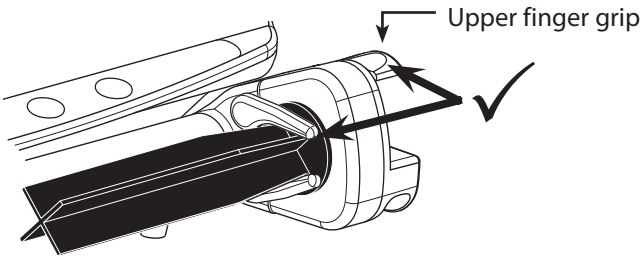


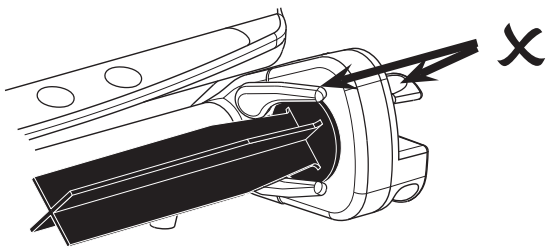
Note: Earlier pumps have a single section syringe flange clamp. In this instance place the syringe barrel flange in the space between the syringe clamp and the syringe flange clamp.



To ensure the syringe is loaded correctly, check the syringe remains in position before the syringe clamp is closed.

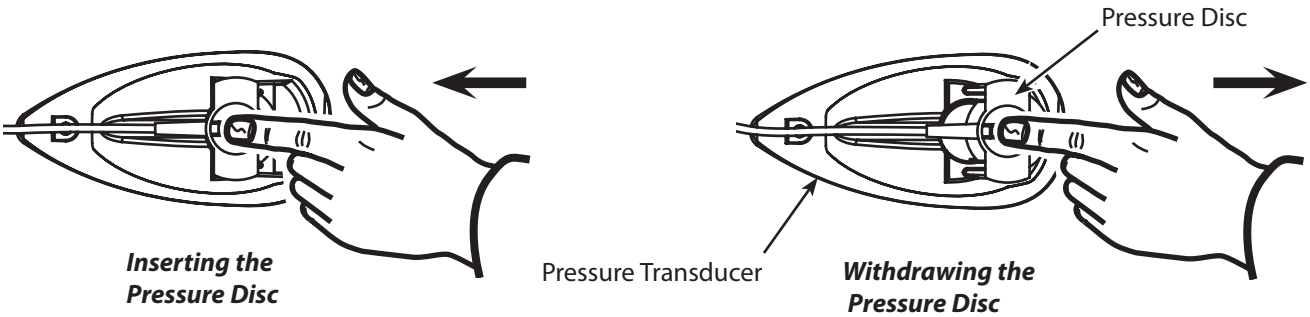
3. Lift the syringe clamp until it locks against the syringe barrel.
4. Squeeze the finger grips on the plunger holder and slide the mechanism to the left until it reaches the plunger end.
5. Release the finger grips. Ensure that the plunger grippers are securing the plunger in place and the upper finger grip returns to its original position.





Ensure that both plunger grippers are fully locked onto the plunger flange and the upper finger grip has returned to its original position.

Guide to handling the pressure disc



When withdrawing the pressure disc, make sure you pull it (with your finger inside the disc recess) towards the front of the pump as shown in the diagram above.

Starting the pump

1. Push pump on to bar, the Alaris® Docking Station or mount to pole. Connect to AC Mains.
2. Press the button to switch pump ON.
3. Follow SETUP / Drug / Profile instructions as per Directions For Use.
4. Load syringe.
5. Insert pressure disc into pressure transducer (Model CC only, required for dedicated mode).
6. Confirm syringe.
7. Change the rate if necessary using the keys.
8. Purge: Press the button followed by the **PURGE** softkey.
9. Connect the pump to test equipment as required (see chapter 2 Configuration & Calibration).
10. Press the button to start the infusion.

Basic features

Pressure Level (not available on Model GS)	Press the button. Pressure Alarm level and current pressure level are shown on graph. Use the keys to adjust pressure alarm level.
Volume to be Infused (not available on Models TIVA & GS)	Press **VTBI**. Enter VTBI using the keys. Press **OK**. Select rate at end of VTBI using the keys. Press **OK**.
Clear Volume Infused	Press **VOLUME**. Select **YES** (to clear) or **NO** (to exit).
Purge/Bolus	Press the button, use the keys to set rate, then press and hold down the **PURGE** or **BOLUS** softkey.
Hands-free Bolus* (Model TIVA only)	Press the button, if required, select **HANDSFREE BOLUS**, use the keys to adjust bolus dose. Use rate softkey to adjust bolus rate if required. Press **BOLUS** softkey to deliver.

During PURGE/BOLUS, the pressure limit alarms are temporarily increased to maximum levels.

Option Button ?

Drug Library*	Select Drugs and Dosing (Models CC & TIVA) or Drug name (Model GH).
Set VTBI Over Time	Specify a VTBI and delivery time *(not available on Models TIVA & GS)*. Pump must be on hold.
24 Hour Log	Volume infused log over 24 hours and accumulative total (on the hour only).
Rate Lock	Disables changing rate once infusion has started *(not available on* Model *TIVA)*.

When rate lock is enabled, the following are unavailable:
1. Rate changes/titration
2. Bolus/Purge
3. Switch pump off

Event Log*	Access Event Log. The Event Log holds up to 1500 individual events. Pumps with Guardrails® Software enabled retain one year of events.
Hospital Name*	Displays the name of Hospital/Ward/Department as set up on the pump. Accessible while the pump is infusing.

Additional options may be shown, please refer to the relevant Directions For Use, for more information.

*** Note:** For Guardrails® Software enabled pumps or the Alaris® PK Syringe Pump these options may vary or will not be available. Please refer to the relevant Alaris® Syringe Pump Directions For Use or Guardrails® Editor Directions For Use for comprehensive information.

Chapter 2

Configuration & Calibration

In this chapter

Access codes	**10**
Dedication options (301/302)	**10**
Data Set Activation (612)	**10**
Handsfree Bolus (175)	**10**
Power Lock (711)	**10**
Configuration options (251)	**11**
Calibration procedures (243)	**15**

Access codes

The syringe pump software contains a number of configuration and test routines that can be accessed by the user. The majority of tests are 'MENU' driven from a technical access code (see below).

Code	Description
123	Self Test Procedure
166	External Reprogramming
167	Teach Learn Procedure
175	Handsfree Bolus
243	Calibration Selection Menu
251	User Configuration Menu
301	Fully Dedicated
302	Semi-dedicated
376	Service Access Menu
401	Upload Data Set to Pump (Guardrails® Software enabled Pumps and the Alaris® PK Syringe Pump)
402	Download CQI Event Log from Pump (Guardrails® Software enabled Pumps only)
418	Alternative Alarm Tone. (Not available for Guardrails® Software enabled Pumps & the Alaris® PK Syringe Pump)
499	Download Data Set from Pump (Guardrails® Software enabled Pumps and the Alaris® PK Syringe Pump)
611	Cold Start (RAM Clear)
612	Data Set activitation (Alaris® PK Syringe Pump)
711	Power Lock (Alaris® PK Syringe Pump)

Each MENU (and some unique items) has its own three-digit access code that can be entered using the following procedure:

1. Hold down ⏻ and turn the pump ON.
2. Enter the required access code using the ⏶⏷ keys and the **NEXT** softkey.
3. When the required code shows on screen, press **OK** to confirm.

Dedication options (301/302)

Fully Dedicated (set using access code **301**) will remind a user that a pressure disc must be fitted to start any infusion. In this mode occlusion pressures are always displayed in mmHg.

Semi-Dedicated (set using access code **302**) will remind a user that a pressure disc must be fitted when drugs and dosing features are used. When a pressure disc is not in use, pressure levels L-0 to L-10 will be displayed.

Data Set Activation (612)

This code is used to load the predefined pump configuration and drug setup into the non-volatile storage. It is necessary to enter the code **612** after a cold start (code **611**); the configuration and drug setup will then be available in normal operation.

Alternatively a data set may be uploaded as appropriate. See directions for use contained within the Alaris® PK Editor Software package.

Handsfree Bolus (175)

Enable or disable the Handsfree Bolus. If enabled pressing bolus button displays screen prompting for hands free or hands on. Default volume after clear setup is 0.0. Upper amount restricted to bolus volume limit in general options or drug protocol bolus volume limit.

Power Lock (711)

Available on the Alaris® PK Syringe Pumps with software V2.3.11 & above.

Disabled The new alternative Power Down sequence now allows the user to Power Down the pump whilst the infusion is suspended (on hold) in TCI mode and predictive TIVA mode.

Enabled The Power Down sequence (Power Lock) remains the same where the user may only Power Down the pump by stopping the infusion, selecting 'new operation' from the options menu, confirming the selection, then Powering Down the pump.

Configuration options (251)

Enter access code **251** to display the User Configuration menu:

Drug Library* Set drug names list on a Model GH - Select Character Group Select Character
To go to next Character use **NEXT**.
Set drug names and protocols for Models CC and TIVA (*see drug protocol setup instructions on following pages*).

General Options* See table on the following page.

Clock Set Set the current date and time. To set the clock, use and **NEXT** to adjust and **OK** to store.

Hospital Name* Enables establishment name (max 20 characters) to be displayed during the power-up sequence.
To set the hospital name, use and **NEXT** to adjust and **OK** to store.

Enable Syringes* Configure the type and size of syringes permitted for use.
To enable syringes, use and **SELECT**, to enable/disable and **OK** to store.

Language Configure the language used for messages shown on display.
Select language required using and **SELECT** to store.

Contrast Set the display panel contrast. Use to adjust contrast and **OK** to store.

Enable Units* Select the type of units permitted for use on the pump. To enable units, use and **MODIFY**, to enable/disable and **OK** to store.

*** Note:** For Guardrails® Software enabled pumps and the Alaris® PK Syringe Pump these options may vary or will not be available. Please refer to the relevant Alaris® Syringe Pump Directions For Use or Guardrails® Editor Directions For Use for comprehensive information.

Configuration options (251) *(continued)*

Alaris® TIVA Syringe Pump drug protocol setup

Select Drug Library from Configuration Options (**251**).

Use ⏫🔼🔽⏬ to select drug and press **MODIFY** to modify selected drug or **NEW** to create new drug name.

QUIT will return to **251** main menu.

When modifying a drug protocol, pressing **BACK** at any time will take you to the previous step.

Modify - Existing drug

ENABLE/DISABLE - Enables or disables the drug being available.

DELETE - Select Yes to delete from drug library.

EDIT - See table below.

Edit Drug Protocol - New or existing drug

Press **OK** softkey to confirm each step.

Drug Option	**To Adjust** (Softkeys are shown in **Bold**)
Drug Name	Select Character Group ⏫🔼🔽⏬ Select Character ⏫🔼🔽⏬ To go to next Character **NEXT**
Concentration Units	⏫🔼🔽⏬
Minimum Concentration	⏫🔼🔽⏬ or **OFF**
Default Concentration	⏫🔼🔽⏬ or **OFF**
Maximum Concentration	⏫🔼🔽⏬ or **OFF**
Dose Rate Units	⏫🔼🔽⏬
Induction Dose	⏫🔼🔽⏬ or **OFF**
Induction Time	⏫🔼🔽⏬
Pause After Induction	**MODIFY**
Maintenance Rate	⏫🔼🔽⏬
Bolus Dose	⏫🔼🔽⏬
Bolus Rate	**RATE**
Hands Free Bolus	**MODIFY**

Configuration options (251) *(continued)*

Alaris® CC Syringe Pump* drug protocol setup

Select Drug Library from Configuration Options (**251**).

Use ⏫🔼🔽⏬ to select drug and press **MODIFY** to modify selected drug or **NEW** to create new drug name.

QUIT will return to **251** Main menu.

When modifying a drug protocol, pressing **BACK** at any time will take you to the previous step.

Modify - Existing drug

ENABLE/DISABLE - Enables or disables the drug being available.

DELETE - Select Yes to delete from drug library.

EDIT - See table below.

Edit Drug Protocol - New or existing drug

Press **OK** softkey to confirm each step.

* **Note:** For Guardrails® Software enabled pumps this option will not be available. Please refer to the relevant Alaris® Syringe Pump Directions For Use or Guardrails® Editor Directions For Use for comprehensive information.

Drug Option	**To Adjust** (Softkeys are shown in **Bold**)
Drug Name	Select Character Group ⏫🔼🔽⏬ Select Character ⏪◀▶⏩ To go to next Character **NEXT**
Dose Rate Units	⏫🔼🔽⏬
Maximum Dose	⏫🔼🔽⏬ or **OFF**
Default Dose	⏫🔼🔽⏬ or **OFF**
Minimum Dose	⏫🔼🔽⏬ or **OFF**
Concentration Units	⏫🔼🔽⏬
Minimum Concentration	⏫🔼🔽⏬ or **OFF**
Default Concentration	⏫🔼🔽⏬ or **OFF**
Maximum Concentration	⏫🔼🔽⏬ or **OFF**
Maximum Bolus	⏫🔼🔽⏬ or **OFF**
Bolus Rate	⏫🔼🔽⏬
Pressure Alarm	⏫🔼🔽⏬ or **OFF**

Configuration options (251) (*continued*)

General options

		Models			
Option	**Description**	**GS**	**GH***	**CC***	**TIVA**
NURSE CALL FITTED	Enables Nurse Call (hardware option).	✓	✓	✓	✓
NURSE CALL INVERT	When enabled, the nurse call output is inverted.	✓	✓	✓	✓
RS232 SELECTED	Sets the pump's communications to use RS232 (hardware option).	✓	✓	✓	✓
NEOI WARNING	Sets the Near End Of Infusion (NEOI) warning time.	✓	✓	✓	✓
EOI POINT	Sets the End Of Infusion volume.	✓	✓	✓	✓
KVO AT EOI	Enables pump to run at the Keep Vein Open (KVO) rate when End Of Infusion (EOI) is reached.	✓	✓	✓	✓
KVO RATE	Sets the Keep Vein Open (KVO) rate.	✓	✓	✓	✓
BACK OFF	Motor will reverse to relieve line pressure when an occlusion occurs.	✓	✓	✓	✓
AUTO SAVE	When disabled, the patient information is cleared on power up.	✓	✓	✓	×
RATE LOCK	When enabled, the rate can be locked to prevent unwanted changes of the set infusion rate.	✓	✓	✓	×
QUIET MODE	When enabled, the button beeps are muted.	✓	✓	✓	×
AC FAIL	When enabled, the AC Power Failure Alarm will sound if AC power is disconnected.	✓	✓	✓	✓
RATE TITRATION	When enabled, the rate can be changed whilst the pump is infusing.	×	✓	✓	×
PRESSURE DISPLAY	Enables / disables the Pressure Icon on the main display.	✓	✓	✓	✓
AUTO PRESSURE	Enables / disables the automatic pressure alarm level option.	×	×	✓	×
AUTO SET PRESSURE	Automatically sets the line occlusion pressure alarm level to a specified amount above the current pressure.	×	×	✓	×
AUTO OFFSET	Adjusts the automatic offset value used by auto pressure and auto set pressure.	×	×	✓	×
HANDS FREE BOLUS	Enables / disables hands-free bolus.	×	×	×	✓
CAP PRESSURE	Sets the maximum pressure limit.	×	✓	×	×
PRESSURE DEFAULT	Sets the default occlusion alarm level.	✓	✓	✓	✓
DEFAULT BOLUS VOLUME	Sets the default hands-free bolus volume for No Drug mode only.	×	×	×	✓
MAX PRESSURE	Sets the maximum pressure limit.	×	×	✓	×
WEIGHT	Sets the default patient weight in kg.	×	×	✓	✓
CAP RATE	Sets the maximum value for infusion rate.	✓	✓	✓	×
PURGE RATE	Sets the purge rate.	✓	✓	✓	✓
PURGE VOLUME LIMIT	Sets the maximum permissible purge volume.	✓	✓	✓	✓
PURGE SYRINGE	Prompt to purge syringe after confirmation.	✓	✓	✓	✓
BOLUS	Enables / disables the bolus feature.	✓	✓	✓	×
DEFAULT BOLUS	Sets the default bolus rate.	✓	✓	✓	✓
CAP BOLUS RATE	Sets the maximum value for bolus rate.	✓	✓	✓	×
BOLUS VOL LIMIT	Sets the maximum permissible bolus volume.	✓	✓	✓	×
MANUAL BOLUS	Volume infused will be increased if plunger is manually moved in and syringe remains confirmed.	✓	✓	✓	✓
CALL BACK TIME	Adjusts the time for the pump to sound the call back alarm.	✓	✓	✓	✓
VTBI CLEAR RATE	Rate will be set to zero when VTBI has been set-up with stop as the end rate.	×	✓	✓	×
EVENT LOG DISPLAY	Enables / disables the event log display.	✓	✓	✓	✓
BATTERY ICON	Enables / Disable the Battery Icon on the main display.**	✓	✓	✓	✓
AUDIO VOLUME	Sets the alarm volume of the pump at high, medium or low.	✓	✓	✓	✓
AUTO NIGHT MODE	Sets Backlight to dim between 21:00 and 06:00hrs.	✓	✓	✓	✓

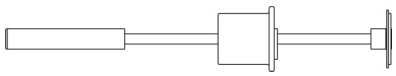
Key:
✓ = available option
× = unavailable option

* For Guardrails® Software enabled pumps and the Alaris® PK Syringe Pump these options may vary or will not be available, with only the first three options listed in table above adjustable in the General Options on the pump. Please refer to the relevant Alaris® Syringe Pump Directions For Use or Guardrails® Editor Directions For Use for comprehensive information.
** For Alaris® GS Syringe Pump the battery icon can be seen via the Options menu by pressing the ⑦ key.

Calibration procedures (243)

Enter access code **243** to display the Calibration Selection menu (see Access Codes).

SYRINGE CLAMP calibration



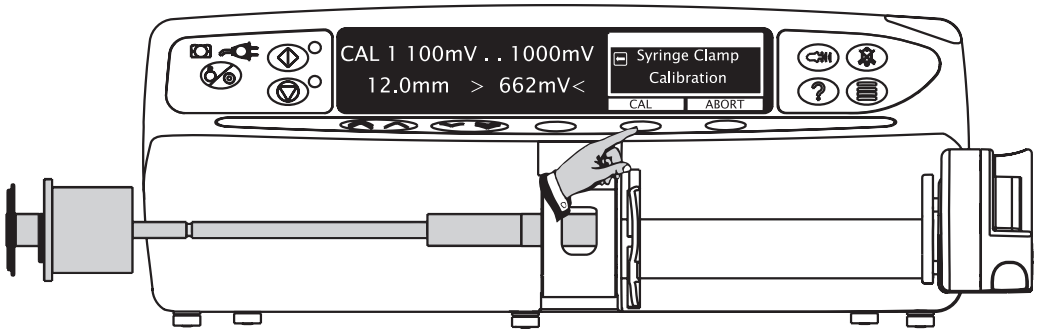
Calibration tool required: 1000TG00095

Fit calibration tool into position on pump as shown in Steps 1-2 and close the clamp. At each step, CAL is displayed if value is within tolerances.
Press CAL button to store calibration point.

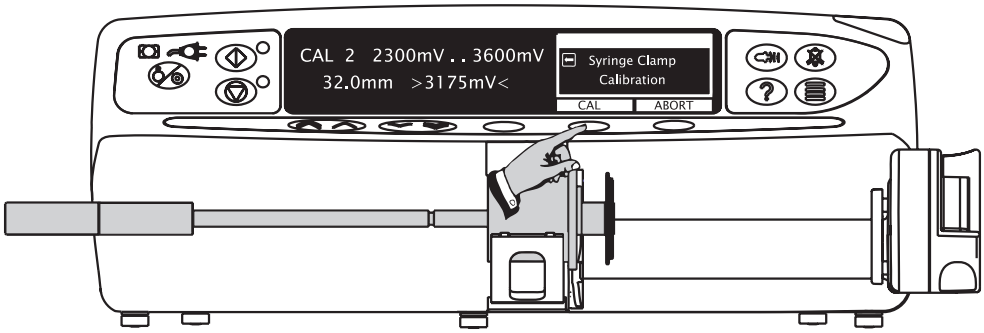
Note: If CAL is not displayed, check for correct positioning of calibration tool. If calibration cannot be performed, repairs to pump may be necessary.

Note: The calibration values shown on the displays are for illustrative use only and may vary.

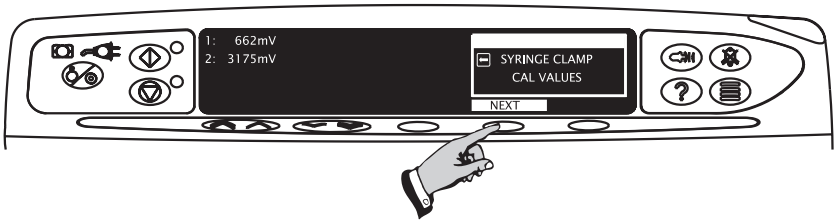
Step 1



Step 2



Step 3



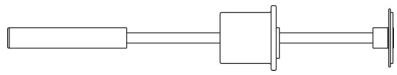
Calibration procedures (243) *(continued)*

PLUNGER POS (position) calibration

Fit calibration tool in position on pump as shown in Steps 1-3. At each step CAL is displayed if value is within tolerance. Press CAL button to store calibration point.

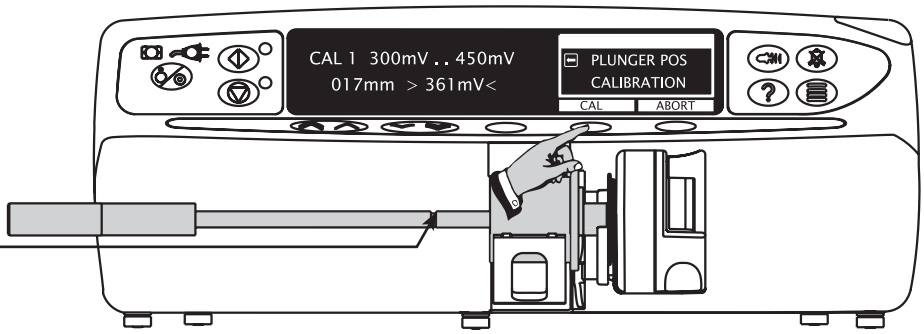
Note: If CAL is not displayed, check for correct positioning of calibration tool. If calibration cannot be performed, repairs to pump may be necessary.

Note: The calibration values shown on the displays are for illustrative use only and may vary.



Calibration tool required: 1000TG00095

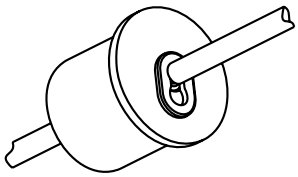
Step 1

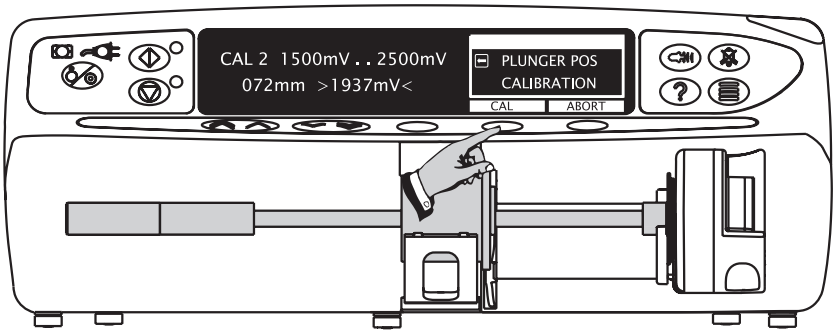


Channel for locking clip

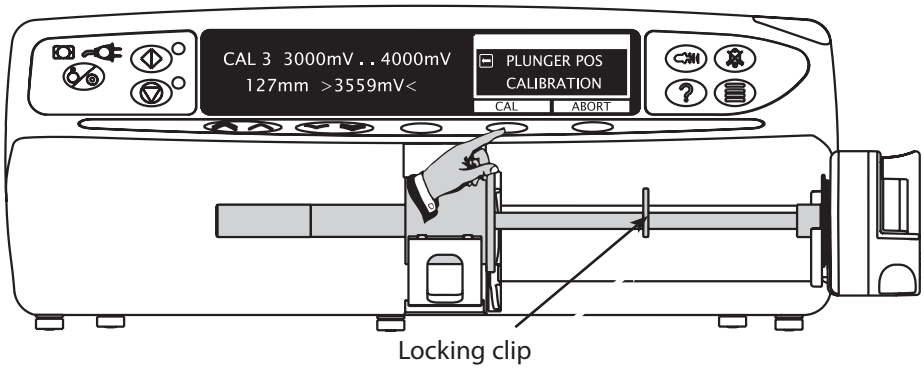
Step 2

Close-up of calibration tool, showing locking clip in position.



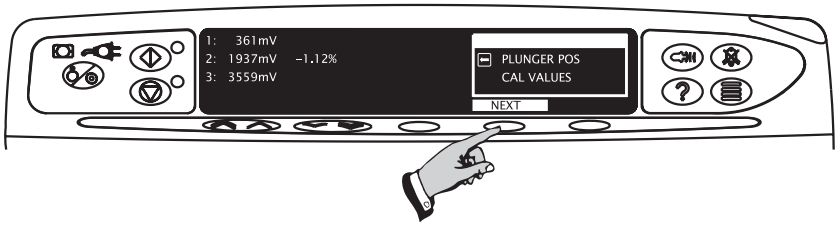


Step 3



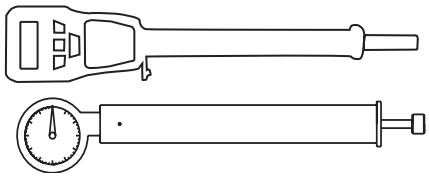
Locking clip

Step 4



Calibration procedures (243) *(continued)*

SYRINGE FORCE calibration



Calibration tool required:
0000TG00200 (top) or
0000TG00020 (bottom)

Precondition:

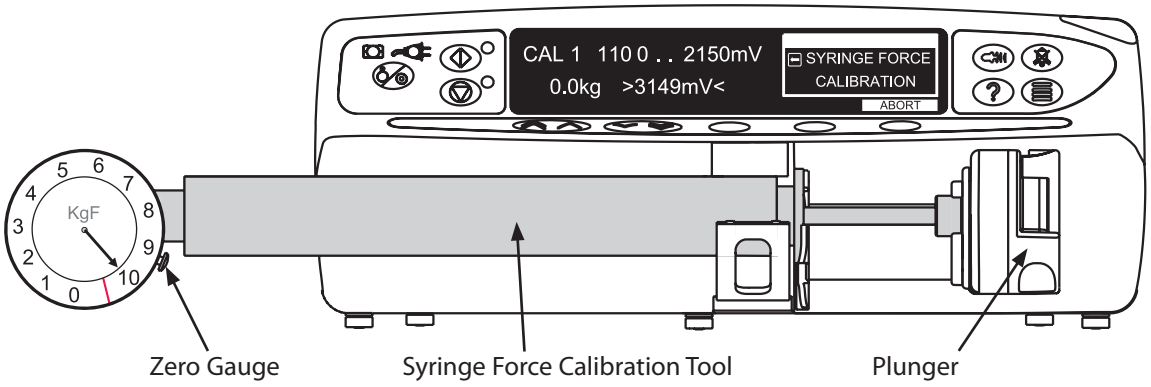
This preconditions the mechanism and should only be done if motorplate or chassis has been replaced. Fit Calibration tool as shown, zero the gauge, run until gauge registers 10kgf and then carefully declutch mechanism and withdraw plunger. Do not press any button during this procedure.

To convert Kilograms of Force (kgf) to Newtons (N) multiply by 9.806650. For example 10kgf = 98.07N.

Excessive force will damage the plunger mechanism. Do not apply more than 10 kgf ±0.05kgf to the plunger mechanism at any time.

Note: The calibration values shown on the displays are for illustrative use only and may vary.

Precondition
10kgf ±0.05kgf

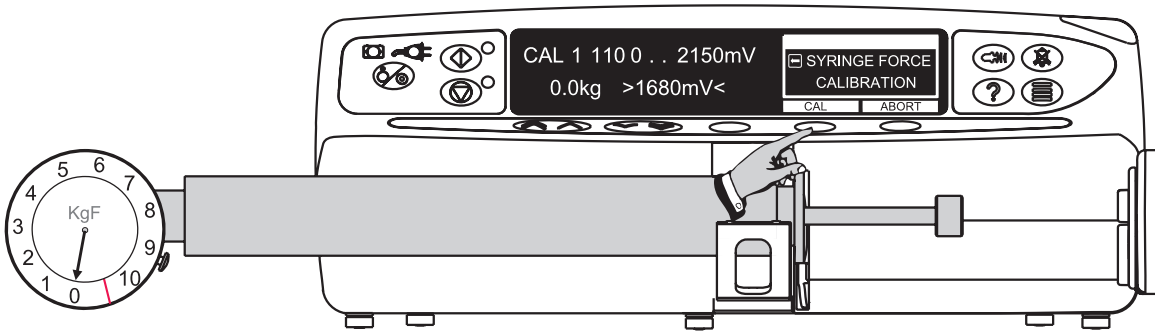


Fit Calibration tool and position plunger as shown in Steps 1 to 3, zero the gauge. At each step press CAL when required calibration force is reached.

Note: If CAL does not appear in display, check for correct positioning of tool. If calibration cannot be performed, repairs to pump may be necessary.

Allow 30 seconds for pressure to stabilise following any preconditioning calibration.

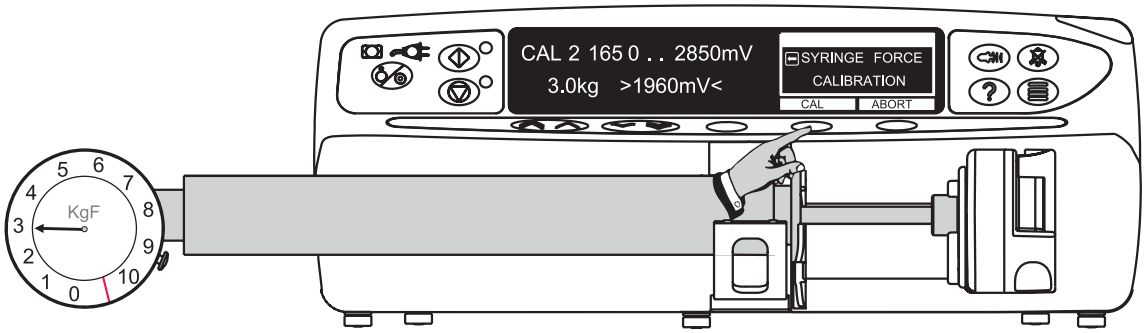
Step 1
0kgf ±0.05kgf



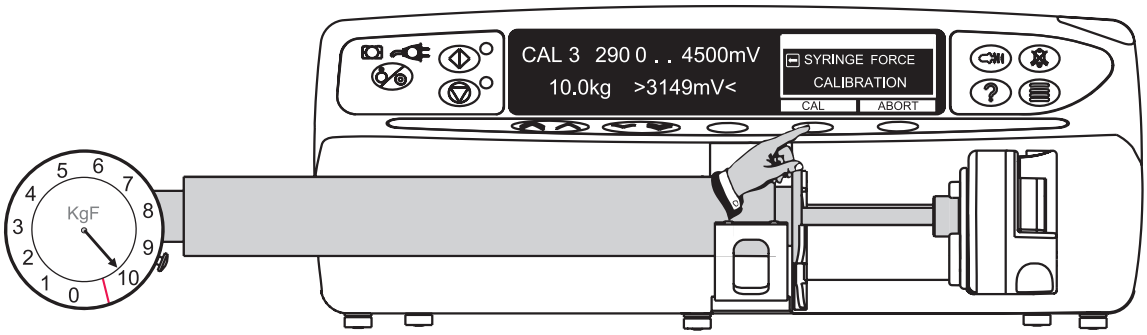
Calibration procedures (243) *(continued)*

SYRINGE FORCE calibration (continued)

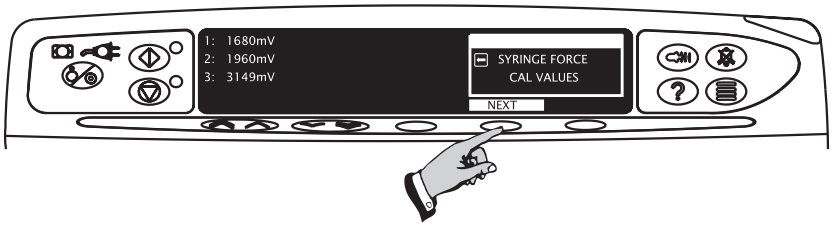
Step 2
3Kgf ±0.05Kgf



Step 3
10Kgf ±0.05Kgf



Step 4



Use of the 0000TG00200 Digital Occlusion Testgear.
The 0000TG00200 Occlusion testgear uses a digital force gauge to register applied forces. Please refer to the MecMesin Compact Gauge Operation Instructions supplied for detailed operational information and power options and requirements.

To prepare the testgear for use, load into the syringe pump.
- ***Ensure there is nothing touching the testgear plunger (such as the syringe plunger drive).***
- ***Turn on the Compact Gauge using the 'On/Zero' key.***
- ***Select 'kg' force units, and 'MAX' reading option.***
- ***If the display indicates other than 0.00kg, zero the system using the 'On/Zero' key.***

Operate the system as required for performing the calibration activity.

Before the next use, ensure the 'MAX' reading is cleared using the 'On/Zero' key.

Calibration procedures (243) *(continued)*

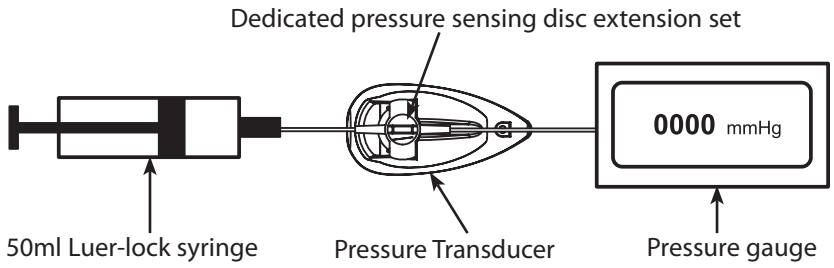
LINE PRESSURE calibration – Alaris® CC Syringe Pump ONLY

Tools required:

Pressure gauge (range 0-1400 mmHg)
(Tolerance +/- 0.1mmHg)

Dedicated pressure sensing disc extension set
(i.e. G30402M)

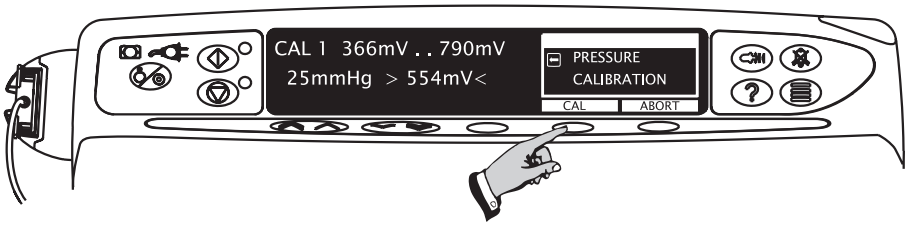
50ml Luer-lock syringe



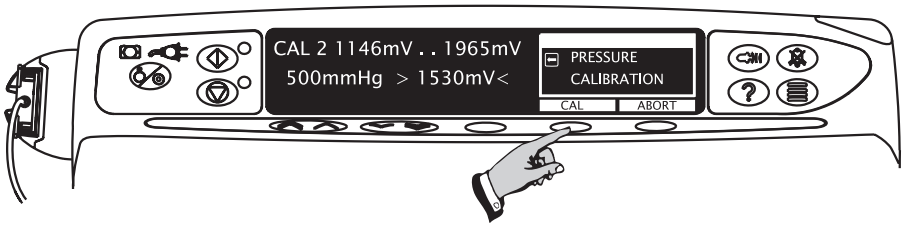
Load pressure disc infusion set into transducer. Connect infusion set to syringe and gauge. Using syringe, apply pressure required as shown at steps 1-3. At each step press CAL when required calibration pressure is displayed on pressure gauge.

Note: The calibration values shown on the displays are for illustrative use only and may vary.

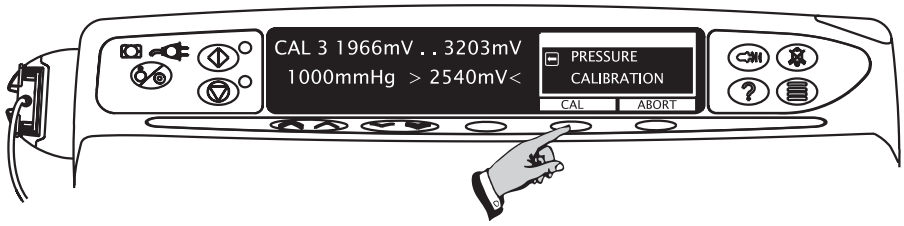
Step 1 **25mmHg ± 1mmHg**



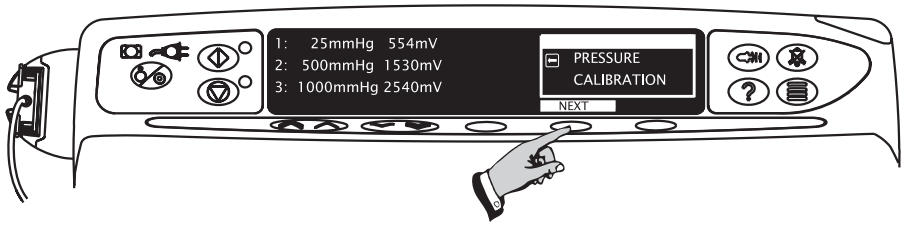
Step 2 **500mmHg ± 1mmHg**



Step 3 **1000mmHg ± 1mmHg**



Step 4



Calibration procedures (243) *(continued)*

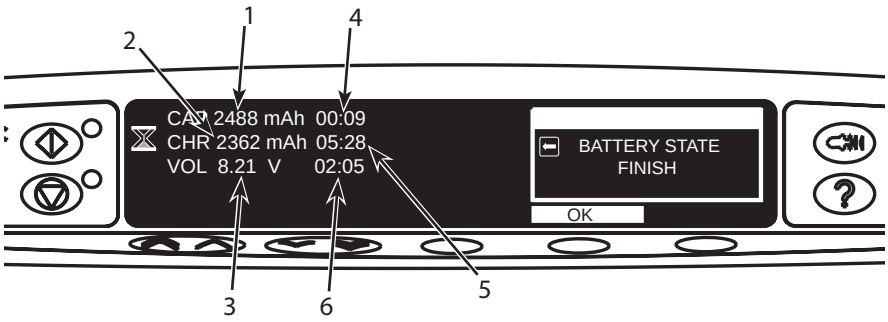
BATTERY calibration

1. Connect the Pump to AC mains.
2. Select BATTERY CALIBRATION from menu and press **OK**.
3. The pump will automatically run the battery calibration. Battery calibration cycles the battery through a charge, discharge and re-charge sequence during which the gas gauge within the battery pack will be updated with a measurement of the current capacity of the cells.

Battery compartment should be ventilated during calibration (open battery cover). Pump may fail calibration if too hot, so care should be taken not to calibrate too many pumps in close proximity (in a docking station, for example). Ensure that the battery is supported as you open the battery compartment.

Disconnecting the AC mains at any time during calibration will cause battery calibration to fail.

4. When calibration is complete, the following is shown on the display:



	Value	Description	Pass Criteria
1	Battery Capacity	Pack capacity value updated after measured discharge phase (if changed).	Greater than 2100mAh
2	Current Battery Charge Level	Current charge in pack.	n/a
3	Battery Voltage	Current pack voltage.	n/a
4	Initial Charge Time	Time taken during intial charge phase. Intial charge phase checks pack is fully charged and if not it is charged.	Lower than 2 hours 59 minutes
5	Discharge Time	Time taken during measured discharge phase. Pack is discharged to determine how much charge is available from the pack.	Between 4 hours 15 minutes & 10 hours
6	Final Charge Time	Time taken during final charge phase. Pack is fully recharged ready for use.	Lower than 2 hours 59 minutes

5. All pass criteria (see table above) should be met and the pump should display FINISH at the end of the calibration otherwise calibration has failed. If calibration has failed retry calibration or replace battery.
6. Press **OK** to exit.

The plunger drive will move automatically during the discharge phase, so ensure that the plunger drive is not obstructed during calibration (remove syringes etc).

Chapter 3

Routine Maintenance

In this chapter

Self-test procedure (123)	**22**
Comms test (123)	**23**
Data transfer	**24**
Information logs (376)	**27**
Recommended cleaning and inspection	**28**
Performance verification procedure	**29**

For routine maintenance, the following self-test and performance verification procedures should be performed.

Refer to the relevant Directions for Use for the recommended routine maintenance period.

Self-test procedure (123)

Self-tests included in full test

Enter access code **123** to view the Test Selection menu (see Access Codes in chapter 2). Refer to table below for the tests in each menu item.

Test Section	Test	Action
Software	Software info	Displays the software version.
	Data Set Info	Displays the Data Set information. (pumps with Guardrails® Safety Software only)
Safety Processor	Safety ID	Check displays the version of the safety ID.
	Safety LED	Check red LED illuminated.
	Safety Alarm	Check Backup alarm sounds.
Full only	Serial Number	Check displays serial number of unit.
	Language	Check displays correct language.
	Real-time Clock	Check displays correct date and time.
	Service Date	Check displays date when service is next required.
Sensor	Disc Detect	Check the display changes correctly to indicate if a disc is Out or In (Model CC only).
	Line Pressure	Check pressure is 000mmHg +/-20mmHg with no pressure applied (Model CC only).
	Motor Encoder	Check motor runs and Passed is displayed.
	Drive Engage	Check display indicates Drive Engaged or Disengaged when clutched/declutched.
	Plunger Fit	Check display indicates if the Plunger button is Out or In.
	Plunger Position	Check display smoothly and continuously changes during full plunger travel.
	Syringe Clamp	Insert the syringe size calibration tool (1000TG00095) and check the following values are displayed for diameters inserted: 12mm diameter = 11.5 to 12.5mm 32mm diameter = 31.5 to 32.5mm
	Syringe Force	Check motor runs and syringe force is displayed.
Battery	Battery	Check displays values in CAP, CHR and VOL; no dashes should be seen.
Audio	Audio Speaker	Check the main audible alarm sounds.
Visual Indicator	Display	Check that all of the display pixels are illuminated.
	Backlight	Check that the backlight switches from LOW to HIGH when indicated.
	Battery LED	Check the Battery LED (Amber) flashes.
	Start LED	Check the Start LED (Green) flashes.
	Stop LED	Check the Stop LED (Amber) flashes.
	Warning LED	Check the Warning LED (Amber) flashes.
	Alarm LED	Check the Alarm LED (Red) flashes.
Key	Keypad	Press the key indicated and check changes to next key.
Comms	Comms	RS232 only. Check Nurse call and RS232 operation.

Self-test procedure (123) *(continued)*

Self-tests not included in full test

Test Section	Test	Action
Remote	Remote	Check the function of the IrDA output for remote access
Calibration records	Syringe clamp	Displays calibration values for Closed and Open positions.
	Plunger position	Displays calibration values for Left, Middle and Right positions.
	Syringe force	Displays calibration values for 0, 3 and 10 kgf.
	Line pressure	Displays calibration values for 25, 500 and 1000mmHg (Model CC only)
Linearity	Linearity	Check the mechanism runs full travel and graph displays smooth linear travel.
	Occlusion base	Check the occlusion base level is within tolerance shown on graph.

Comms test (123)

Select COMMS TEST from the displayed menu. **Note**: Section only applicable if RS232 Hardware option is fitted.

No specific customer test equipment is available to conduct the RS232 on nurse call alarm tests. It is assumed that the customer will have associated systems that make use of the RS232 and nurse call options, hence:

The nurse call system can be tested, once connected to the customer facility, by running the pump and simulating an alarm condition (e.g. Disengaging the drive while running).

The RS232 system can be tested by communicating with the pump using a customer application.

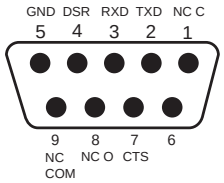
If no customer systems are available for in-use testing, the following connections to the 9 pin D type output socket will permit testing. It is recommended that all test connections are made via a 9 way D type plug that can be fitted into the pump socket.

Test — **Description**

RS232 Test — Only available when Nurse Call option is fitted. **Note**: NURSE CALL FITTED & RS232 SELECTED must be enabled (✓) in access code **251** General Options for this test to work. Connect the 9-pin D type connector to the 9 pin D type output socket at the rear of the pump. The display '_ _ _ _' will change to PASS if the communications test is successful.

Nurse Call — Only available when Nurse Call option is fitted. **Note**: NURSE CALL FITTED & RS232 SELECTED must be enabled (✓) in access code **251** General Options for this test to work. Locate the 9-pin D type connector at the rear of the pump. Check that the Nurse Call relay switches from NC to NO connections during test.

RS232 pinout



Pin Number (Pump Socket Id)	Required Action	Comments
1	Nurse call relay - normally closed connection	With nurse call test in progress - Confirm continuity with pin 5 - Alternately switches with pin 8.
2	Link pin 2 to pin 3	RS232 Tx and RX test link. With RS232 test in progress - Confirm 'PASS' is displayed on test screen.
3	See pin 2	-----
4	Not used	-----
5	0 volt line	With respect to pin 7.
6	Not used	-----
7	Apply 9 to12 volts DC	RS232 Power supply - with respect to pin 9.
8	Nurse call relay - normally open connection	With nurse call test in progress - Check continuity to pin 5 - Alternately switches with pin 1.
9	Nurse call relay - common connection	----

Data transfer

Upgrading software

Upgrade of the Alaris® Syringe Pump (except the Alaris® TIVA Syringe Pump) software to V1.5.10 or greater is recommended at the next service, for Alaris® Syringe Pumps with software versions V1.5.9 and below. Perform upgrades by acquiring the software upgrade kits specified in spare parts listings. This will address a potential issue that may result in a condition where the running LED is flashing, the infusion status shows "INFUSING" but the volume infused display will not increment and no drug will be infused into the patient.

This potential issue may occur under the following remote circumstances :-

(i) A new syringe was recently fitted into the drive mechanism and

(ii) An infusion is started, very quickly stopped and then restarted. (The pump must be stopped between 0.375 secs and 0.435 secs after starting - a window of 0.06 secs.)

If the pump is subsequently stopped and restarted, the infusion will start normally.

When upgrading a pump from one software version to another where the first or middle digit changes, cold start will be required before and after software upgrade. Calibration will also be required after software upgrade and cold start.

Tools required

- The Software Distribution Disk (See table below)
- Programming kit 1000SP00172 (Includes Programme Header and IrDA cable)
- IrDA port on PC or Comms Port
- RS232 cable 1000SP00336
- Ver. 3 Software Maintenance Utility (SMU) 1000CD00028

IrDA power-down test

To check PC is set up correctly for communication with Alaris® Syringe Pumps the Power Down Test needs to be performed on one Alaris® Syringe Pump only as follows:

1. Load the IrDA Power Down Test program on your PC.
2. Select GO on the PC software program.
3. Align the IrDA converter with the pump IrDA window (optimum distance is 5cm).
4. Connect to serial port.
5. Enter access code **166**.
6. Press Yes to continue Bootstrap.
7. Select IrDA interface.
8. Select a Baud rate of 115200.
9. The pump will then display Bootstrap in progress.
10. Press the ⊗ button to silence the alarm.
11. Select Transmit on PC. Check progress bar moves on PC and pump powers down.

Software Versions available

Syringe Pump Model	Software		Enhanced Software		Guardrails® Safety Software
	Mk1/Mk2	Mk3	Mk1/Mk2	Mk3	Mk3
Alaris® GS Syringe Pump	1000SP01221 (MP v1.5.10)	1000SP01225 (MP v2.0.0)	1000SP01270 (MP v1.9.4)	1000SP01276 (MP v2.3.6)	
Alaris® GH Syringe Pump	1000SP01221 (MP v1.5.10)	1000SP01226 (MP v2.0.0)	1000SP01270 (MP v1.9.4)	1000SP01268 (MP v2.3.6)	MP v3.1.4 (Installed by Cardinal Health Personnel)
Alaris® CC Syringe Pump	1000SP01221 (MP v1.5.10)	1000SP01227 (MP v2.0.0)	1000SP01270 (MP v1.9.4)	1000SP01267 (MP v2.3.6)	MP v3.1.4 (Installed by Cardinal Health Personnel)
Alaris® TIVA Syringe Pump	1000SP01221 (MP v1.6.2)	1000SP01228 (MP v2.1.0)	1000SP01270 (MP v1.9.4)	1000SP01269 (MP v2.3.6)	
Alaris® PK Syringe Pump				1000SP01289 (MP v3.2.12)	

Key: MP = Main Processor. Mk1/Mk2/Mk3 are the released versions of the Control PCB.

Data transfer *(continued)*

Soft bootstrap

1. Load the software program onto your PC. Start the 'MP Only' version of relevant pump software. Check the correct pump type is displayed.
2. Select GO.
3. Align the IrDA converter pump with the IrDA window (optimum distance is 5cm), or connect RS232 cable.
4. Connect to serial port.
5. Enter access code **166**.
6. Press Yes to continue Bootstrap.
7. Select IrDA interface or RS232 interface.
8. Select a Baud rate of 115200.
9. The pump will then display Bootstrap in progress.
10. Press the ⊗ button to silence the alarm.
11. Select Start on PC. Monitor progress of all selected channels
12. Power down pump.

Hard bootstrap

1. Load the software program onto your PC. Start the relevant pump software (not the 'MP Only' version).
2. Disconnect the battery and separate the pump.
3 Fit the Programme header onto the control board.
4. Reconnect the battery. The pump will alarm, press the ⊗ button to silence.
5. Align the IrDA converter pump with the IrDA window (optimum distance is 5cm), or connect RS232 cable.
6. Connect to serial port.
7. Switch the Programme header to the correct position either RS232 or IrDA.
8. Switch on the Programme header.
9. Select GO on the PC software program.
10. Select Start on PC. Monitor progress of all selected channels
11. Power down pump.

Cold start

It may be necessary to carry out a cold start if the pump has changed between certain software. Refer to documentation supplied with the software disk to see if cold start is required.

1. Enter access code **611**, then power down when prompted.
2. Perform a full calibration.

Caution - Potential Erasure of Data:
Cold Start erases ALL information from the pump. This feature should only be used when changing between incompatible software versions. Full recalibration and reconfiguration will be required. Cardinal Health technicians should not re-instate drug information (this MUST be left to the customer).

Power Failure
Failures may occur when using laptops when communicating with Alaris® Syringe Pumps, due to power requirements.
External power supply may be used in conjunction with IrDA or RS232 cable to compensate for lack of power from laptop.

Please Note IrDA data transfer can be affected by bright sunlight or fluorescent lighting.

Data transfer *(continued)*

Teach Learn (Software versions V1.4.13 and above)

1. For the teacher pump only (not required for learn pumps), in General Options **251**, switch off RS232 before commencing Teach Learn procedure.
2. Turn the teacher pump on in normal operation.

For multiple teach-learn operations, to avoid call-back alarm every 2 minutes, turn teacher pump on in access code mode.

3. Enter the access code **167** on learn pump.
4. Align the two IrDA ports on the pumps (optimum distance is 5cm).
5. Press OK and then Yes to confirm.
6. A progress bar will travel across the learn pump.
7. When completed, select No to cancel retry.

Possible reasons for failure:

- RS232 is not switched off.
- If software versions are different, confirm teach learn procedure on learner pump to continue. Verify settings after completion of learn.
- The pump models are different. For example, an Alaris® GS Syringe Pump can only teach an Alaris® GS Syringe Pump.
- The line of sight between the IrDA windows was obstructed during data transfer.

Check protocols are correct on learn pump after teach learn procedure, before returning pump to use.
After a Teach/learn procedure it is necessary to clear the previous patient setup in order to update the syringe information. On power-up after Teach/learn and when prompted with CLEAR SETUP, select YES.

Event Log download

A PC application known as the Event Log Download Utility (ELDU) (part number 1000SP00209) is available to download logs from Alaris® Syringe Pumps.

ELDU operation

1. Click on ELDU icon on PC.
2. Click Accept to agree with Restrictions of Use and continue.
3. Select Configure from drop-down menu.
4. Select Setup Pump and choose Alaris® as pump type.
5. Select Settings to select log to be downloaded.
6. Check communications are set as follows:
   - Required PC com port selected.
   - Set baud rate to 38400.
7. Click OK to confirm.
8. Align the IrDA converter pump with the IrDA window (optimum distance is 5cm), or connect RS232 cable.
9. Power up pump.
10. Click Download Log from main screen.
11. Press Close, when finished.
12. Select File from drop-down menu and save file. Log may be printed here as required.

Data transfer *(continued)*

Data Set Upload and Download (401 & 499)

Upload Data Set to an Alaris® Syringe Pump with Guardrails® Safety Software or an Alaris® PK Syringe Pump (401)

Using the Guardrails® Editor Transfer Tool or Alaris® PK Editor Software Transfer Tool allows a released Data Set to be uploaded to an Alaris® Syringe Pump.

Download Data Set from an Alaris® Syringe Pump with Guardrails® Safety Software or an Alaris® PK Syringe Pump (499)

Using the Verification Tool allows an uploaded Data Set in an Alaris® Syringe Pump to be downloaded to a PC for comparison and verification.

Download CQI Event Log (402)

Download CQI Event Log from an Alaris® Syringe Pump with Guardrails® Safety Software (402)

Using the CQI Event Log Downloader allows the CQI Event Log to be downloaded from an Alaris® Syringe Pump to a PC for use with the Guardrails® CQI Reporter. The Guardrails® CQI Reporter is a program for querying and reporting on the collective event data allowing the user to analyse trends in medication administration and track medication errors.

Warning -
At no time should the Guardrails® Safety Software or *the Alaris® PK Editor Software* be used to upload to or download from an Alaris® Syringe Pump while the pump is connected to a patient.

For more information relating to the Guardrails® Editor, the Alaris® PK Editor Software and the Guardrails® CQI Reporter refer to the relevant Directions For Use supplied with the software.

Information logs (376)

Use access code **376** to view the information logs (see Access Codes in chapter 2).

Log	View	Notes
Service	Displays the last 10 fault codes.	Option to view the time and date at which they occur.
Clear Service	Clears any information stored in the service log.	Will not be available if there is no data in the service log.
Event	Displays the complete event log (maximum 1500 events except Pumps with Guardrails® Software enabled which have one year of events).	Option to view the time and date at which they occur.
Key	Displays the last 200 key presses and the time they occurred.	Does not record while in Tech mode.
Use	Displays the hours of use since reset and since last cold start.	Press OK to clear hours since reset.

Access code **376** provides the following additional service options:

Service Date Set the date when pump will display 'Service due' and any service message entered.

Service Message Enter message to be displayed on service date.

Serial Number Record the serial number of the pump.

Unit Reference Free-form text field for user reference only.

Event Log Access provided when standard power-up mode leads to errors such that the Event Log access from the Options ⑦ button cannot be accessed.

PCB Identification Number Allows Control PCB ID to be reviewed. (Pumps with Guardrails® Safety Software only)

Recommended cleaning and inspection

To ensure this pump remains in good operating condition, it is important to keep it clean and carry out the routine procedures described below. All servicing should only be performed by a qualified service engineer.

- Thoroughly clean external surfaces of the pump, by wiping over with a lint-free cloth, lightly dampened with warm water and a standard disinfectant/detergent solution.

  Do not use the following disinfectant types:

  - NaDcc (such as PRESEPT)
  - Hypochlorites (such as CHLORASOL)
  - Aldehydes (such as CIDEX)
  - Cationic Surfactants (such as Benzalkonium Chloride)
  - Iodine (such as Betadine)

Recommended cleaners are:

Brand	**Concentration**
Hibiscrub	20% (v/v)
Virkon	1% (w/v)

Before cleaning always switch OFF and disconnect from the AC power supply. Never allow fluid to enter the casing and avoid excess fluid build up on the pump.
Do not use aggressive cleaning agents as these may damage the exterior surface of the pump.
Do not steam autoclave, ethylene oxide sterilise or immerse this pump in any fluid.

- Labels should be replaced as required if not flat, legible or fully adhered.
- Case components must be checked for damage and replaced if necessary.
- Check the pole clamp is not damaged and that it functions correctly.
- Inspect the AC power supply plug and cable for damage.

Use an appropriate cleaning method that does not allow an excess of fluid to accumulate around the keypads. Aggressive cleaning can potentially create a fluid ingress path into the shelf keypad which can result in keypad failure.

In case of failure, usually resulting in a KY1 error code, the shelf keypad must be replaced. As a preventive measure, shelf keypads manufactured after week number 15, 2003 should be used since they offer more protection to excessive cleaning. The week number may be found on the keypad connection tail.

We recommend that all pumps within the following serial numbers -

Alaris® GS Syringe Pump	***08510 - 09976***
Alaris® GH Syringe Pump	***16437 - 22286***
Alaris® CC Syringe Pump	***03471 - 06632***
Alaris® TIVA Syringe Pump	***01310 - 02369***

(or pumps outside of this range which had their shelf keypad replaced between 2nd July 2002 and 30th April 2003) have their shelf keypad replaced at the next routine service. All other pumps have a shelf keypad that does not exhibit this potential risk.

Performance verification procedure

Model / Serial Number:		**Service Order / Inventory Number:**		
Hospital Name / Reference:		**Software Version:**		
INSPECTION	**Physical inspection and clean**			
UPDATES	**Recommended when serviced**	UPDATE REF:	Fitted ✓	Not fitted / Not Applicable ✓
	For models GS, GH & CC upgrade software version to 1.5.10 or higher	TSM CH3		
	Fit transmission buffer pad below 8001- 03469 & 8002 -06789	TSM CH6		
	Fit modified pole clamp arm as required	TSM CH6		
	Fit support bracket for motor plate (1000SP00408)	TSM CH6		
ERROR LOG CH3 **376**	Check/set serial number, set service date (optional)			
SELF TEST CH3 **123**	**Check all functions in self-test** Check date and time is correct (set as required (251) CH2			
	Syringe size detection test 12 mm spacer (11.5 to 12.5) 32mm spacer (31.5 to 32.5)			
INFUSING	**Alarms functionality check** Drive Disengaged, Check Syringe, AC power fail, Pressure Disc out (CC), Near End of Infusion, Plunger Location, End of Infusion Ensure pump works on battery and AC mains			
VERIFICATION TESTS CH3	**Linear speed test*** Pump set to 200 ml/h, syringe type BD Plastipak 50, for a distance of 15 mm. 2 min 27.01 secs to 2 mins 30.59 secs	_____ mins _____ secs		
	Occlusion test Pump set to 100 ml/h, syringe type BD Plastipak 50, alarm level L-3, 2.7 KgF to 3.3 KgF **OR** Dedicated (CC), alarm level 200 mmHg, drive occlusion at 2.7 KgF to 3.3 KgF	_____ KgF		
	Line pressure readings (CC) Alarm set to 50 mmHg – pump alarms 40 mmHg to 60 mmHg Alarm set to 750 mmHg – pump alarms 710 mmHg to 790 mmHg	_____ mmHg _____ mmHg		
SETUP	**Set rate to zero (or lowest value possible), Clear Volume Infused and VTBI** **Clear Error / Alarm/Battery logs (as required)**			
ELECTRICAL SAFETY TESTS	**Class I Type CF** *Alternatively attach printed test results* Earth Resistance Test <= 0.2 Ω Earth Leakage Current <= 500 µA Enclosure Leakage Current <= 100 µA	_____ Ω _____ µA _____ µA		
Verification Performed By	_____ **Sign**	_____ **Print**	_____ **Date**	

CHX indicates the chapter number in the Technical Service Manual (TSM) - 1000SM00001.

E.G. CH3 = Refer to TSM Chapter 3

**** Latest issue of the plunger protector jig (0000JG00014 Issue 7) has been improved so that the needle of the dial gauge rests upon the plunger head (avoid resting the needle on the moulding flash line) of the pump. This improves the linear speed accuracy test results as any variation caused by the jig movement during the test are eliminated.***

Chapter 4

Troubleshooting

In this chapter

Software fault codes	**31**
Exception error handling	**36**
General fault diagnosis	**36**

Software fault codes

The following errors, MT1, DE1, PF1, PP1 and SC1 may be experienced if the self test operation or calibration operation has been accessed by quitting from the configuration menu. If these are displayed the pump should be power cycled and these operations entered directly.

Code	Module	Failure	Action/Replace
AC1	AC Alarm manager	AC alarm manager failure	Control PCB
AC2		AC VCO failure	
AD1	ADC Converter	Voltage reference/Power regulation	Control PCB
AM1	Audio manager	Audio status output driver	Control PCB
AM2		VCO failure	
AS1	Audio Status	Software execution	Speaker, wiring or Control PCB
AS2		Audio status monitoring input ADC	
AS3		Speaker current test at power up	
BT1	Battery	Battery gas gauge	Battery or Control PCB
BT2		Battery cell voltage is low	
BT3		Battery cell voltage is high	
BT4		Battery discharging when connected to mains.	
CK1	Clock	Excessive timing drift	Control PCB
DE1	Drive Engage Detect	Drive engagement software module	Control PCB
DE2		Drive engagement opto self test	Plunger drive flexi, Control PCB or Transmission PCB flexi
DE3		Emitter in wrong state	
DB1	Drugs Manager	Drug database file system	Control PCB
DB2		Drug database file retrieval	
DB3		Drug database file storage	
DB4		CRC Error	
DS1	Dosing Manager	Dosing retrieval failure	Control PCB
DS2		Dosing storage failure	
DS3		Dosing data failure	
DS4		Dosing drug library failure	
DS5		Dosing patient data failure	
DS6		Dosing IDFS failure	
DS7		Dosing Data Set manager failure	
DS8		Dosing Profile manager failure	
DSM1	Data Set Manager	Data Set loading failure	Upload or check Data Set
DSM2		Data Set integrity failure	
DSM3		Data Set incompatible format	
DSM4		Data Set CRC failure	
DSM5		Data Set read failure	Upload or check Data Set Control PCB
DSM6		Data Set element CRC failure	
DSM7		Data Set storage failure	Control PCB
DSM8		Data Set storage retrieval failure	
DSM9		Data Set data corruption	

Software fault codes *(continued)*

Code	Module	Failure	Action/Replace
EV1	Event Log	Open log file at power up	Control PCB
EV2		File storage software module	
EV3		Log read index	
EV4		Log write index	
EV5		Log data read	
EV6		Log data write	
EV7		Log data seek	
EV8		Log repair failure	
EV9		Log format failure	
EV10		Log reporting failure	
EV11		Log extracting failure	
EV12		Log pack failure	
EV13		Log unpack failure	
FD1	Fluid Delivery	Fluid delivery software module	Control PCB
FD2		Alarm manager software module	
FD3		Plunger drive software module	
FD4		Pressure monitor software module	
FD5		Syringe software module	
FD6		User configuration software module	
FD7		Fluid delivery setup data retrieval	
FD8		Fluid delivery setup data storage	
FD9		Fluid delivery critical data	
FD11		VI cross check error	
FL1	Fluid Log	Open fluid log file at power up	Control PCB
FL2		File storage software module	
FL3		Log read index	
FL4		Log write index	
FL5		Log data read	
FL6		Log data write	
FL7		Log data seek	
FL8		Log repair failure	
FL9		Log format failure	
FL10		Log reporting failure	
FL11		Log extracting failure	
FL12		Log pack failure	
FL13		Log unpack failure	
GG1	Gas Gauge	Communications with gas gauge	Battery or Control PCB
GR1	Guardrails® Limit	Guardrails® Limit failure	Control PCB
IM1	Identification Manager	Data corrupt	Control PCB
IM2		Serial number to set	Set Serial Number in access code 376
IM3		RTC to set	Set RTC in access code 251. Control PCB
IM4		Storage failure	Control PCB

Software fault codes *(continued)*

Code	Module	Failure	Action/Replace
KL1	Key Log	Open key log file at power up	Control PCB
KL2		File storage software module	
KL3		Log read index	
KL4		Log write index	
KL5		Log data read	
KL6		Log data write	
KL7		Log data seek	
KL8		Log repair failure	
KL9		Log format failure	
KL10		Log reporting failure	
KL11		Log extracting failure	
KL12		Log pack failure	
KL13		Log unpack failure	
KY1	Keypad	Keypad key stuck down for 10mins	Keypad or Control PCB
KY2		Line failure	
LC2	LCD	LCD control parameter storage	Control PCB or Display PCB
LC3		LCD display memory test	
ME1	Motor Encoder	Motor encoder module software	Motor encoder or Control PCB
ME2		Overrun detected	
ME3		Motor encoder interrupt service software run when encoder is disabled	
MT1	Stepper Motor	Motor module software	Check motor wire connections, opto flag not slipping and encoder gear is not in line with opto. Chassis PCB, Control PCB.
MT2		Encoder has failed, preventing motor software continuing to run	
MT3		Safety processor has failed, preventing motor software continuing to run	
MT4		Motor rotation in wrong direction	
MT5		Motor rotation speed has drifted	
MT6		Running at wrong rate	
MT7		Motor rotation detected when it should be stopped	
MT8		Motor not rotating when it should be	
MT9		Motor rotation inhibit control of Safety Processor	
MT10		Motor rotation travel data has reached maximum value	
MT11			
MT12		Motor critical data	
NC1	Nurse Call	ADC preventing nurse call operation	Control PCB or RS232/Nurse Call PCB
NC2		Monitor signal is out of range	
NC3		Relay current monitor drive	
NC4		Safety processor failure	
PA1	Patient Data	Patient Data retrieval failure	Control PCB
PA2		Patient Data storage failure	
PA3		Patient Data data error	
PA4		Patient Data IDFS error	
PB1	Plunger Button	Plunger button module software	Plunger drive flexi, Control PCB or Transmission PCB flexi
PB2		Plunger button opto self test	
PB3		Emitter in wrong state	

Software fault codes *(continued)*

Code	Module	Failure	Action/Replace
PC1	PIP Controller	PIP Controller software module	Control PCB
PC2		PIP Controller critical data	
PC3		Phase module critical data	
PC4		Fluid delivery software module	
PC5		PIP Controller setup data retrieval	
PC6		PIP Controller setup data storage	
PD1	Pressure Disc	Pressure disc module software	Pressure disc opto or Control PCB
PD2		Pressure disc opto self test	
PD3		Emitter in wrong state	
PF1	Plunger Fitment	Plunger fitment software module	Optos,Cables, Control PCB or Plunger assy.
PF2		Gripper opto module software	
PF3		Plunger button opto module software	
PFM1	Profile Manager	Profile storage failure	Control PCB
PFM2		Profile retrieval failure	
PFM3		Profile startup failure	
PFM4		Profile data corruption	
PG1	Plunger Grippers	Plunger gripper module software	Plunger gripper opto, Transmission PCB, or Control PCB
PG2		Plunger gripper opto self test	
PG3		Emitter in wrong state	
PL1	Plunger Drive	Plunger drive software module	Control PCB or Chassis PCB
PL2		Alarm manager software module	
PL3		Plunger drive travel deviation	Calibrate linear travel. Plunger position linear potentiometer. Control PCB or Chassis PCB
PL4		Plunger position monitor software	Control PCB or Chassis PCB
PL5		Motor software module	
PL6		Syringe software module	
PL7		User configuration option software	
PM1	Pressure Measurement	Pressure measurement software	Control PCB
PM2		Pressure sensor	
PM3		Syringe force	
PM4		User configuration options	
PM5		Syringe	
PM6		Setup retrieval failure	
PM7		Setup storage failure	
PP1	Plunger Position Monitor	Plunger position monitor software	Control PCB
PP2		ADC	
PP3		Plunger position sensor	Plunger position linear potentiometer.
PP4		Plunger position sensor calibration	Calibrate linear travel
PP5		Plunger position cal data retrieval	Control PCB
PP6		Plunger position cal data storage	
PP7		Drive engagement software	

Software fault codes *(continued)*

Code	Module	Failure	Action/Replace
PS1	Pressure Sensor	Pressure sensor software module	Control PCB
PS2		ADC	
PS3		Current reading invalid	Pressure sensor or Control PCB
PS4		Voltage (Normal) reading invalid	
PS5		Voltage (Test) reading invalid	
PS6		Pressure sensor calibration	Calibrate pressure sensor
PS7		Pressure sensor cal data retrieval	Control PCB
PS8		Pressure sensor cal data storage	
PS9		Pressure sensor amplifier gain	Pressure sensor or Control PCB
PS10		Pressure sensor shift failure	
SC1	Syringe Clamp	Syringe clamp software module	Control PCB or syringe clamp potentiometer
SC2		ADC	
SC3		Syringe clamp sensor readings	
SC4		Syringe clamp calibration	Calibrate syringe clamp
SC5		Syringe clamp cal data retrieval	Control PCB
SC6		Syringe clamp cal data storage	
SD1	SD Data	Service data file retrieval	Perform Cold start. Control PCB
SD2		Service data file storage	
SD3		Service data file contents	
SF1	Syringe Force	Syringe force sensor software	Control PCB
SF2		ADC	
SF3		Syringe force sensor current reading	Motor plate or Control PCB
SF4		Syringe force sensor normal reading	
SF5		Voltage (test) reading	
SF6		Syringe force sensor calibration	Calibrate syringe force
SF7		Syringe force cal data retrieval	Control PCB
SF8		Syringe force cal data storage	
SF9		Syringe force sensor amplifier	Motor plate or Control PCB
SF10		Syringe force output	Calibrate syringe force. Motor plate.
SP1	Safety Processor	Safety processor program memory	Control PCB
SP2		Safety processor ID version	
SP3		Safety processor	
SV1	Service Log	Service Log software module	Control PCB
SV2		File storage software module	
SV3		Log read index	
SV4		Log write index	
SV5		Log data read	
SV6		Log data write	
SV7		Log data seek	
SV8		Log repair failure	
SV9		Log format failure	
SV10		Log reporting failure	
SV11		Log extracting failure	
SV12		Log pack failure	
SV13		Log unpack failure	

Software fault codes *(continued)*

Code	Module	Failure	Action/Replace
SY1	Syringe Manager	Syringe manager software module	Control PCB
SY2		Syringe clamp	
SY4		Plunger fitment	
SY5		Plunger button stuck in	Check plunger button. Control PCB.
SY6		Syringe data table retrieval	Control PCB
SY7		Syringe data table storage	
TC0	PK / TCI	No fault found	Contact your local Cardinal Health, Alaris® Products service representative
TC1		TCI data corruption	
TC2		TCI not configured	
TC3		TCI incorrect state	
TC4-12		PK Model error 4-12	
TC13		PK Model parameters error	
TC14		PK Model init error	
UC1	User Config. options	User config. option file retrieval	Control PCB
UC2		User config. option file storage	
UC3		User config. option data retrieval	
UC4		User configuration model	Perform Cold start
UT1	User Timer	User timer master clock	Control PCB
UT2		User timer software request	

Exception error handling

Exception errors include Assertion Errors and Enum Failure Errors and are used to trap logical errors in the software execution.

The pump will display the error type, the title of the software module in which the error occurred and the line number. The user should make a note of these for use in diagnosis. This information is stored in the service log (access code **376**).

After an error, the pump will not store information when powered down. When the pump is switched on again, the user should always confirm clear setup if this is not done automatically.

General fault diagnosis

		Parts to Check/Test									
		Front Case	Rear Case	Labels & Keypads	Mechanism	Control PCB	Power PCB	Display PCB	Battery	Mains Lead	Fuses
General Fault	Dropped or damaged	✓	✓		✓	✓	✓	✓			
	Exposed to fluids	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	No battery power			✓		✓			✓		
	No AC mains power			✓		✓	✓			✓	✓
	Delivery rates out of tolerance	✓			✓	✓					

Chapter 5

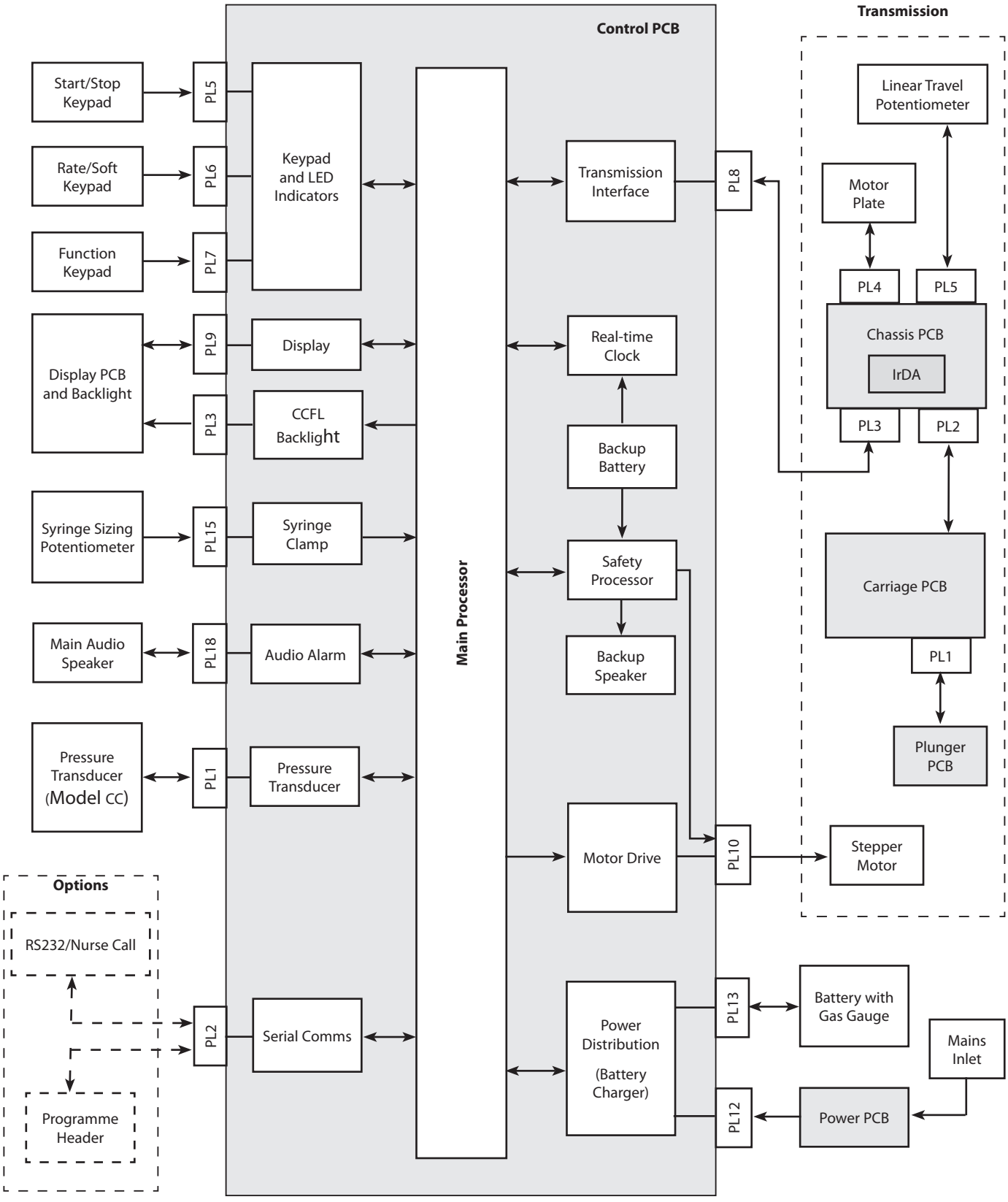
Circuit Descriptions

In this chapter

Functional module block diagram 38

Module overview functional description 39

Functional module block diagram



Module overview functional description

The Alaris® Syringe Pumps are designed to be serviced generally to major assembly level. The PCBs are designed as non-serviceable items and as such, can only be replaced as complete parts.

The major assemblies are:

- Control PCB
- Power Supply Unit PCB
- Display PCB
- Battery
- Transmission
- Transducer (Model CC)

Cardinal Health will make available, on request, circuit diagrams which will assist appropriately qualified technical personnel to repair those parts of the device which are designated by the manufacturer as repairable.

Control PCB

Contains the main processor module, which provides the control functions for almost all aspects of the pump. It drives and monitors all other modules using the program code stored in the flash eprom. The main processor runs the main application program. The main processor directly interfaces to:

- Safety Processor
- Keypads
- Display
- Real Time Clock
- Communications Switch to IrDA and RS232 (optional) interfaces
- Nurse Call Output
- Indicator LEDs
- Audible Alarm
- Motor – controller and dual channel coil driver DAC
- System Sensors (including: syringe clamp, plunger position, drive engagement opto, plunger button opto, syringe force sensor, line pressure sensor, pressure disc opto, motor encoder, AC power).
- Backlight
- Power supply
- Battery gas gauge

The function of the Safety Processor Module is to ensure the correct operation of the Main Processor by constantly exchanging data. If an error is detected, the module can independently disable the stepper motor that drives the transmission. Additionally, it can create both audible and visible alarms using its dedicated piezoelectric buzzer, alarm LED and, if fitted, the Nurse Call Interface.

The Safety Processor controls (independent of main processor):

- Audio sounder
- Visual indicator LED
- Control signal to inhibit motor drive
- Power supply hold up control

Pressure Transducer (Model CC)

Monitors the line pressure when the pressure disc is inserted and flags the presence of a pressure disc. The Control PCB checks the transducer for presence of a pressure disc and the line pressure when a disc is present.

Power Supply Unit PCB

The Power Supply Unit (PSU) is a single output switched-mode power supply rated at 15 VDC/1.6 A continuous duty. The PSU has a wide input voltage range of 85 to 264VAC, 47-63 Hz single phase.

Display PCB

The Pump uses a Cold Cathode Fluorescent Lamp (CCFL) as a backlight for the negative mode LCD display. The CCFL Backlight Supply Module generates the high voltages required to drive the lamp and facilitates software based brightness control.

Battery

The Battery Pack Module provides system power in the absence of a mains supply.

The Battery Pack Module consists of six 1.2V 2.7Ah NiMH battery cells connected in series, a thermal fuse, thermal circuit breaker and Gas Gauge Module sealed in a heat shrink sleeving.

The Gas Gauge Module is permanently connected across the battery terminals so that it can monitor terminal voltage, charge / discharge current and the battery pack temperature.

Through charge monitoring information, from the Gas Gauge Module, the Control PCB Main Processor Module determines the battery charge level and hence 'Battery Low' and 'Battery Empty' conditions.

Battery capacity will reduce over time.

Annual battery calibration is recommended to update Gas Gauge Module with 'up to date' battery capacity information.

If the battery pack fails to achieve the calibration limits, it is recommended that the battery pack is replaced and calibration performed.

Transmission

The Transmission Interface Module provides the Pump with the capability of monitoring a number of critical parameters associated with the transmission operation. The device can detect failures or incorrect operation of the transmission and prevent incorrect drug dosage administration.

The electronics for this module occupy three separate PCBs that are located in various areas of the transmission as follows:

Plunger PCB – Located inside the Plunger Holder Assembly. Contains the electronics that detect correct syringe plunger location and gripper motion.

Carriage PCB – Located on the Transmission Carriage. Contains electronics that detect correct engagement of the Half Nut with the Leadscrew.

Chassis PCB – Located on the Chassis Extrusion. This facilitates measurement of motor speed, syringe drive force and linear plunger position. Additionally, the IrDA compliant infrared transceiver is positioned on the reverse side of this PCB. The stepper motor which drives the mechanical transmission of the pump is controlled by the Motor Drive module on the Control PCB.

Chapter 6

Spare Parts Replacement Procedures

In this chapter

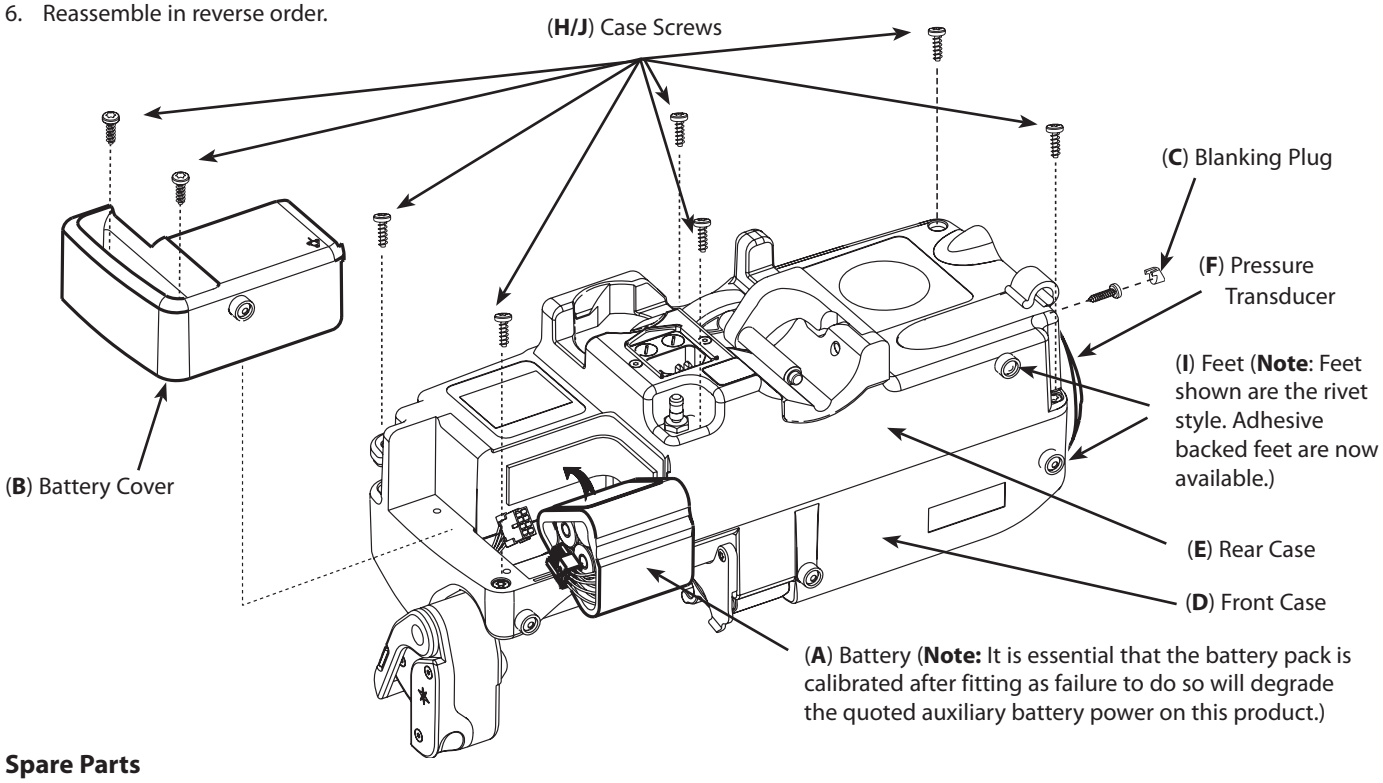
Access to pump	**41**
Rear case and subassemblies	**43**
Front case and subassemblies	**47**
Pressure transducer assembly (Model CC)	**57**
Keypads and labels	**58**

Ensure the pump is disconnected from the AC power supply and switched off before attempting to service.
The pump contains static-sensitive components and therefore strict ESD precautions should be observed at all times.
Always protect the plunger holder and syringe clamp when the pump is upside down. For regular servicing, the use of the case support cradle Part No. 0000JG00047 is recommended.
Batteries should be disposed of as outlined by the local country regulations. Do not send batteries back to the manufacturer.
For fastener torque settings, please refer to Appendix D Fitting & Replacement guidelines.
Only use Cardinal Health recommended spare parts.
Following all spare part replacement and repair activities, testing must be performed in accordance with the Performance Verification Procedure (PVP), see Chapter 3, 'Routine Maintenance'.

Access to pump

Replacement Procedure

1. Remove the two case screws in battery cover, remove cover and battery.
2. Remove the six case screws.
3. Model CC only: Insert a flat-blade screwdriver into the blanking plug of transducer, prise plug away from transducer and remove securing screw.
4. Carefully separate case halves and disconnect cables.
5. Where necessary, remove the foot rivets with a flat-blade screwdriver and remove the feet from the case. Refer to additional information on the following page concerning rivet orientation.
6. Reassemble in reverse order.



Spare Parts

Item	Description	Part Number
A	ASENA SP, Assy, Battery	1000SP01122
B	ASENA SP, Battery Cover/Handle	1000SP01121
C	ASENA CC, Assy, Plug Blanking Transducer	1000ME01317
D	ASENA GS, Kit, Front Case	1000SP00478
D	ASENA GH, Kit, Front Case	1000SP00479
D	ASENA TIVA, Kit, Front Case	1000SP00480
D	ASENA CC, Kit, Front Case	1000SP01153
D	ASENA PK, Kit, Front Case	1000SP01204
E	Alaris GS/GH/TIVA/PK, Kit, Rear Case	1000SP01115
E	ASENA CC, Kit, Rear case	1000SP01154
F	ASENA CC, Kit, Pressure Transducer	1000SP01155
G	ASENA SP, Case Sealing Cord (1m) (internal, not shown)	1000ME00311
H	ASENA SP, Kit, Fixings (screws, washers etc)	1000SP00466
I	ASENA SP, Kit, Spare adhesive foot rivet replacement	1000SP00593
I	ASENA SP, Kit, Spare adhesive foot	1000SP00595
J	Alaris SP main case screws 80 off	1000SP01325

Access to pump *(continued)*

The Pump has two types of rivet feet, one type is white and the other is black. The rivet feet can be removed and replaced without opening the pump, and may be replaced with adhesive backed feet as described below.

There are also two types of cases, one that had rivet feet and therefore holes in the cases for them and the other is without the holes but only a recess for the adhesive backed foot to fit into.

For cases that had rivet feet and therefore holes, kit 1000SP00593 is required. For cases without the holes, kit 1000SP00595 is required.

Kit 1000SP00593 contains a fitting instruction, 242 adhesive backed feet, 242 foot bonding pads and one 20g tube of Loctite 454 gel adhesive. This kit is intended as a replacement for the rivet style foot and has enough feet for 48 pumps.

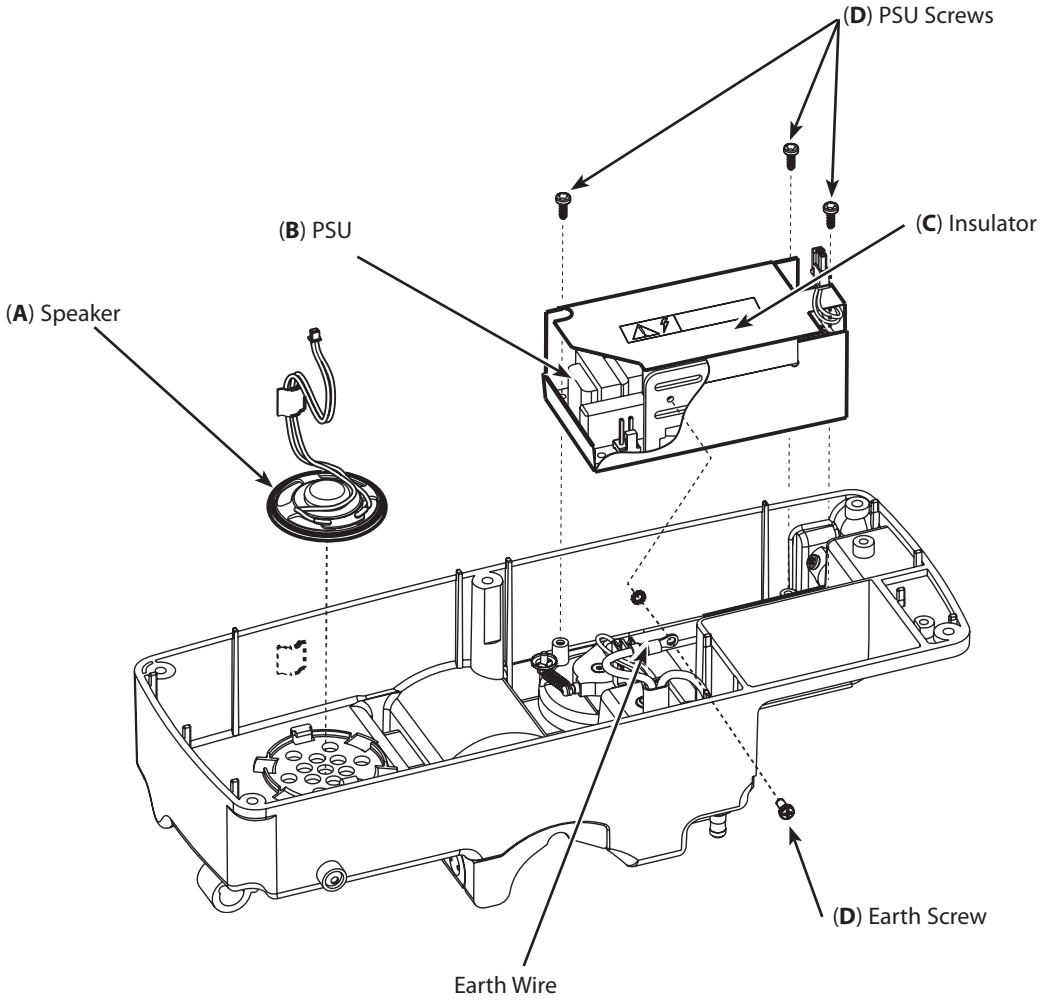
Kit 1000SP00595 contains 11 adhesive backed feet only. This kit is intended for cases that do not have the rivet feet and therefore no holes in the cases. Only a recess is present for the adhesive backed foot to be placed into.

Rear case and subassemblies

Power Supply Unit & Speaker

Replacement Procedure

1. Disconnect the PSU cable.
2. Remove the three PSU screws.
3. Remove earth wire screw and washer.
4. Remove PSU and insulator.
5. With a pair of soft-faced pliers, carefully compress the catch holding the internal speaker and pull the speaker up and out.
6. Reassemble in reverse order.



Spare Parts

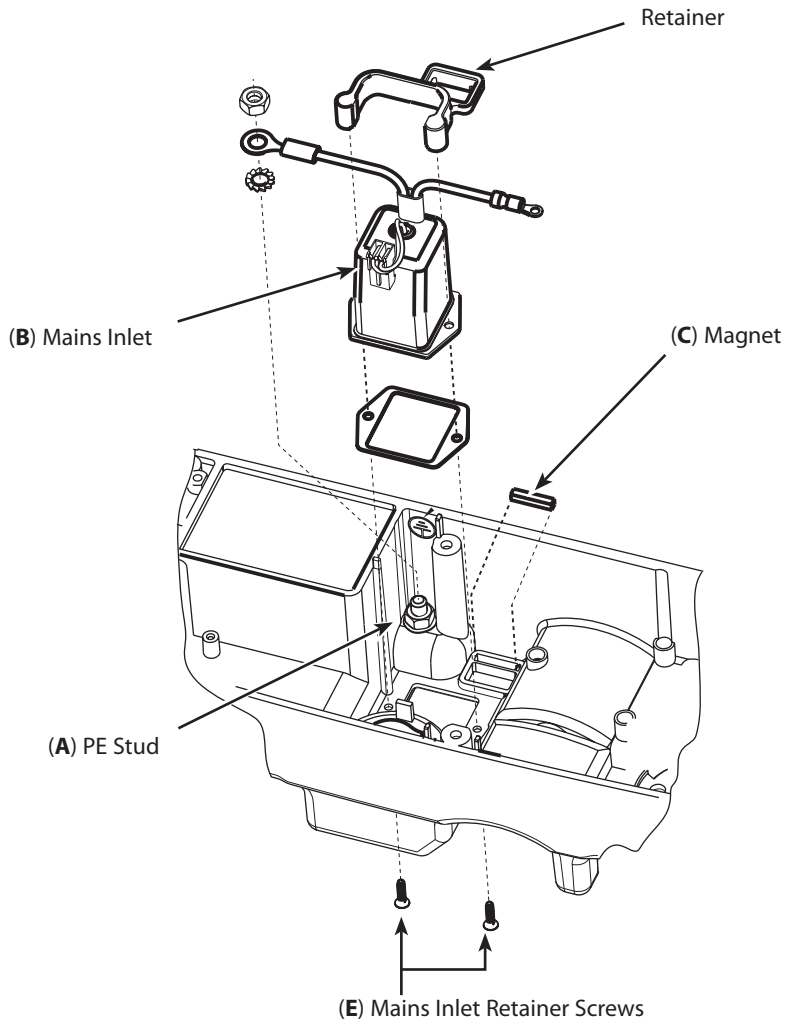
Item	Description	Part Number
A	ASENA SP, Kit, Speaker	1000SP01130
B	ASENA SP, Assy, Power Supply Unit (PSU)	8000EL00063
C	ASENA SP, Assy, PSU Insulator	1000ME01306
D	ASENA SP, Kit, Fixings (screws, washers etc)	1000SP00466

Rear case and subassemblies *(continued)*

Rear case – mains inlet, PE stud and magnet

Replacement Procedure

1. Remove two nuts to remove PE stud.
2. Remove the two screws on Mains inlet.
3. Remove mains inlet and retainer.
4. Remove magnet by lifting one end.
5. Reassemble in reverse order.



Spare Parts

Item	Description	Part Number
A	ASENA SP/GW, Kit, PE Stud	1000SP00467
B	ASENA SP, Kit, Mains Inlet	1000SP01124
C	Magnet IR Detect	1000ME01303
D	ASENA SP, Fuse, T-1.25A Slow Blow, Mains (not shown)	1000EL00222
E	ASENA SP, Kit, Fixings (screws, washers etc)	1000SP00466

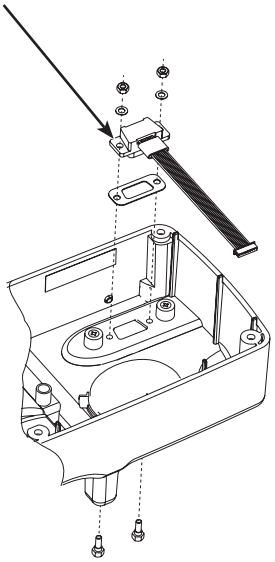
Rear case and subassemblies *(continued)*

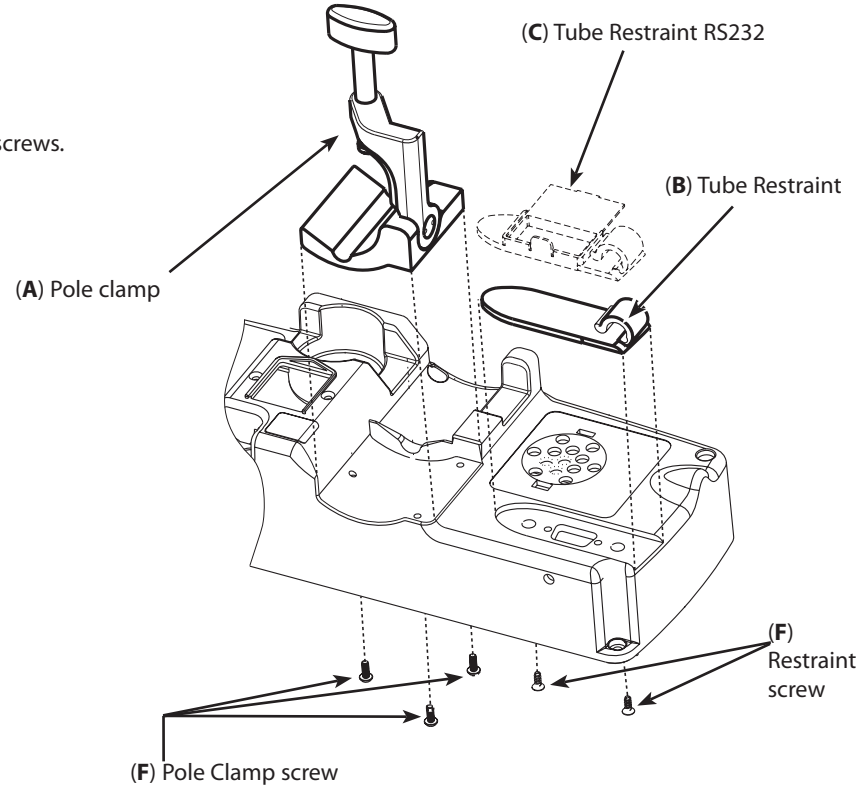
Pole clamp and RS232

Replacement Procedure

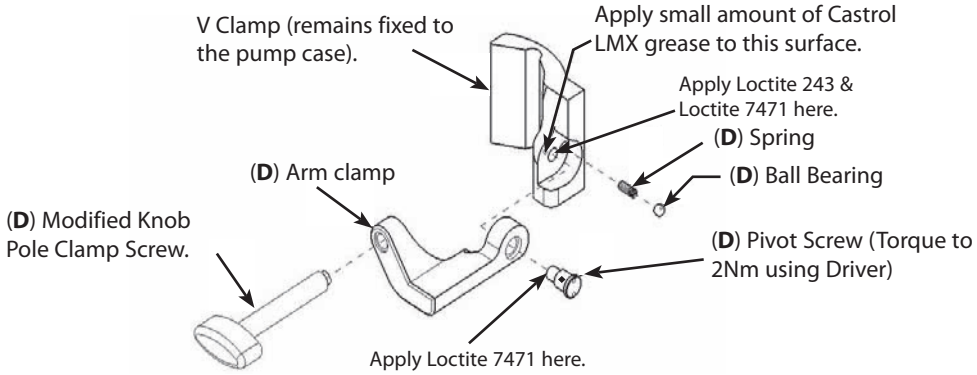
1. Remove three pole clamp screws.
2. Remove two tube restraint screws.
3. Remove two nuts & washers from RS232 socket screws.
4. Reassemble in reverse order.

(**E**) RS232 Socket Connector





The Pole Clamp Arm material has been changed to a stronger material to prevent the arm from bending when tightened.
The Pole Clamp Arm spares kit replaces parts of the Pole Clamp assembly to address bent or slipping Pole Clamps.
Note: There is no requirement to remove the V Clamp.



Spare Parts

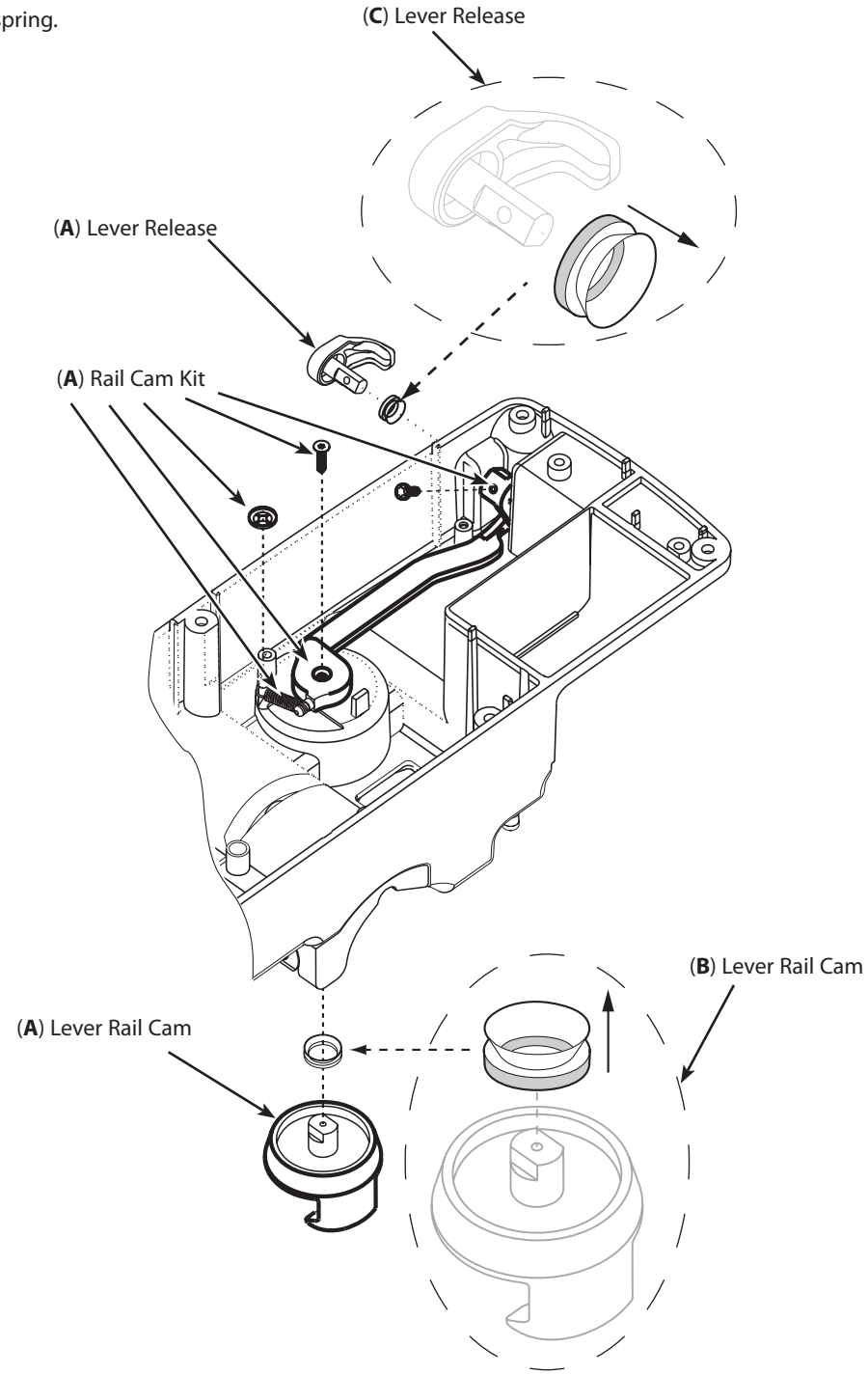
Item	Description	Part Number
A	ASENA SP, Assy, Pole clamp	1000SP00115
B	ASENA SP, Tube restraint blank	1000ME01213
C	ASENA SP, Tube restraint RS232	1000ME01214
D	SPARE KIT POLE CLAMP ARM	1000SP00589
E	ASENA SP/GW, Kit, RS232 connector	1000SP00468
F	ASENA SP, Kit, Fixings (screws, washers etc)	1000SP00466
G	POLE CLAMP SNAKE EYE DRIVER (NOT SHOWN)	1000ME01466

Rear case and subassemblies *(continued)*

Rail cam

Replacement Procedure

1. Remove screw from lever release.
2. Remove screw from lever rail cam.
3. Remove locking washer from spring.
4. Reassemble in reverse order.



Spare Parts

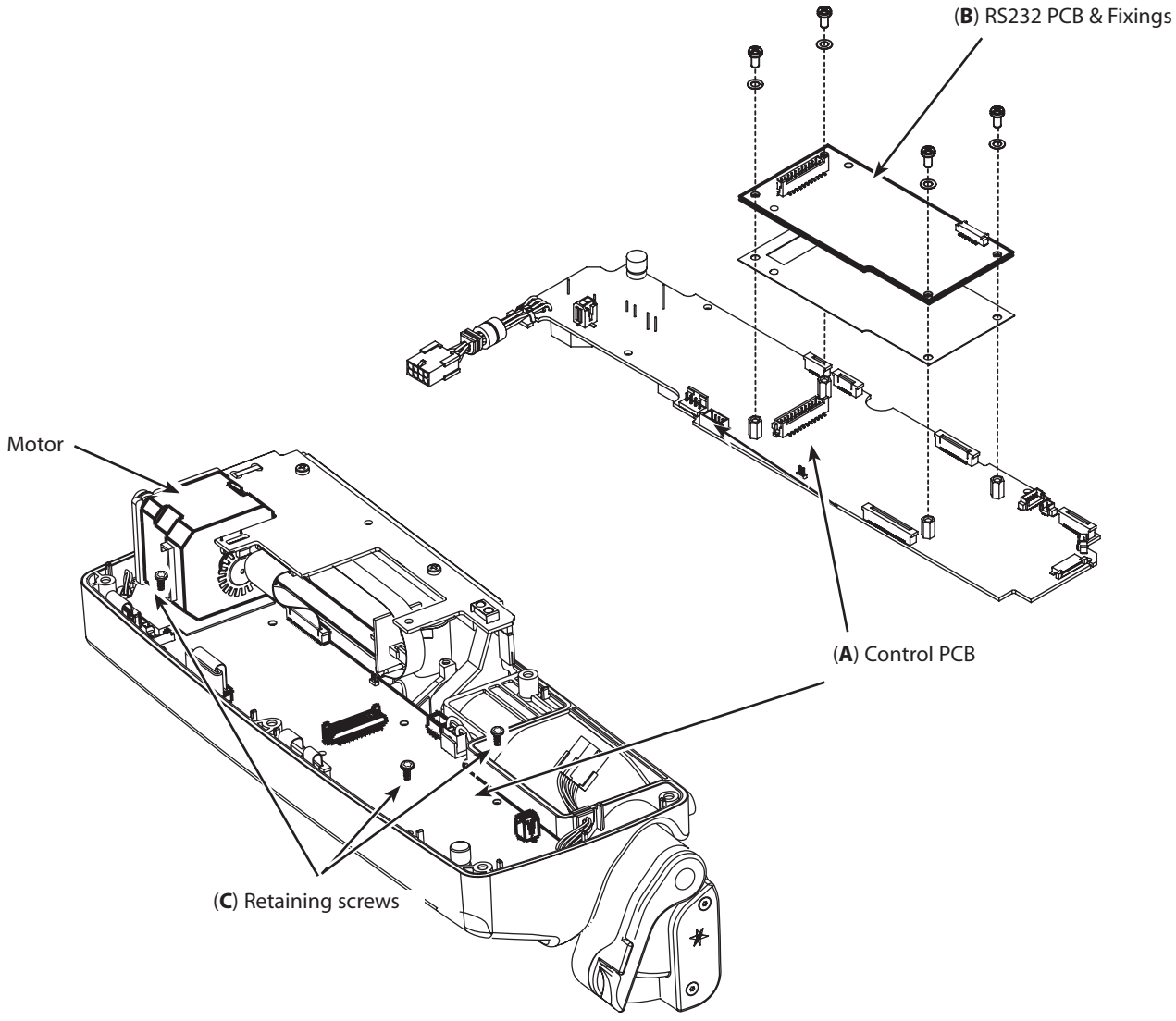
Item	Description	Part Number
A	ASENA SP, Kit, Rail Cam	1000SP01114
B	Alaris SP Cam rail clamp only kit	1000SP01323
C	Alaris SP Cam rail relase level only kit	1000SP01324

Front case and subassemblies

Front case – Control PCB and RS232 (if option fitted)

Replacement Procedure

1. Disconnect cable from RS232 PCB.
2. Remove the four retaining screws and washers from RS232 PCB.
3. Remove the three retaining screws and disconnect all flexi and cable connections. Push the motor towards the transmission to ease removal of Control PCB.
4. When fitting Control PCB ensure all flexi and cables are routed clear of PCB.
5. Connect all flexi and cable connections - secure with the three retaining screws.
6. Reassemble RS232 PCB in reverse order.



Spare Parts

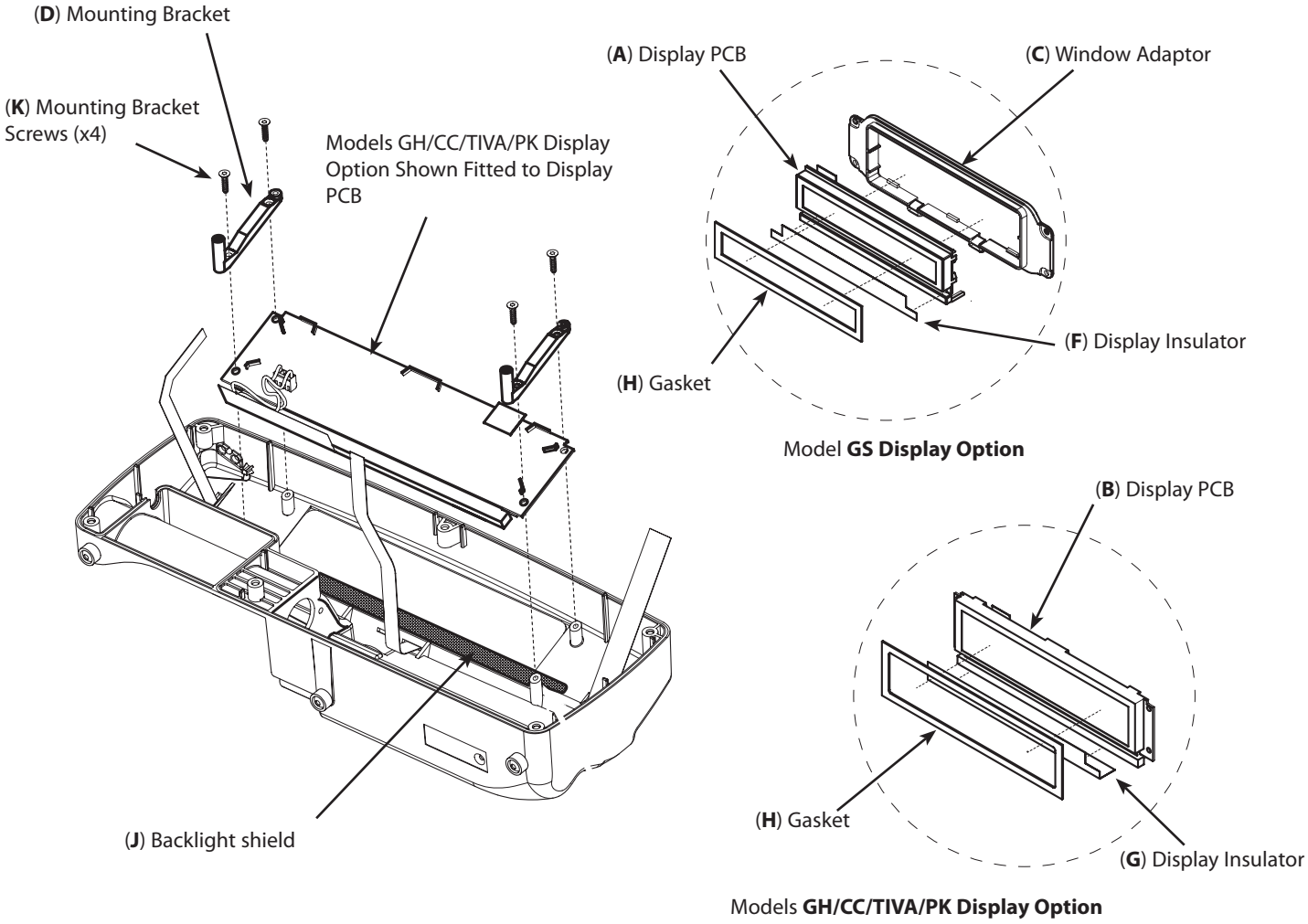
Item	Description	Part Number
A	Asena GS, Control PCB, Mk3	1000SP01275
A	Asena GH, Control PCB, Mk3	1000SP01272
A	Asena CC, Control PCB, Mk3	1000SP01271
A	Asena TIVA, Control PCB, Mk3	1000SP01273
A	Asena PK, Control PCB, Mk3	1000SP01218
B	ASENA SP, Kit, RS232 (PCB & Fixings)	1000SP01160
C	ASENA SP, Kit, Fixings (screws, washers etc)	1000SP00466

Front case and subassemblies *(continued)*

Display PCB

Replacement Procedure

1. Remove the flexible circuit ferrite.
2. Remove the four display fixing screws and two display mounting brackets.
3. Reassemble in reverse order. For the Model GS fit the adaptor bracket to the display.
4. Secure the shelf keypad flexi to the display using double-sided adhesive pad.



Spare Parts

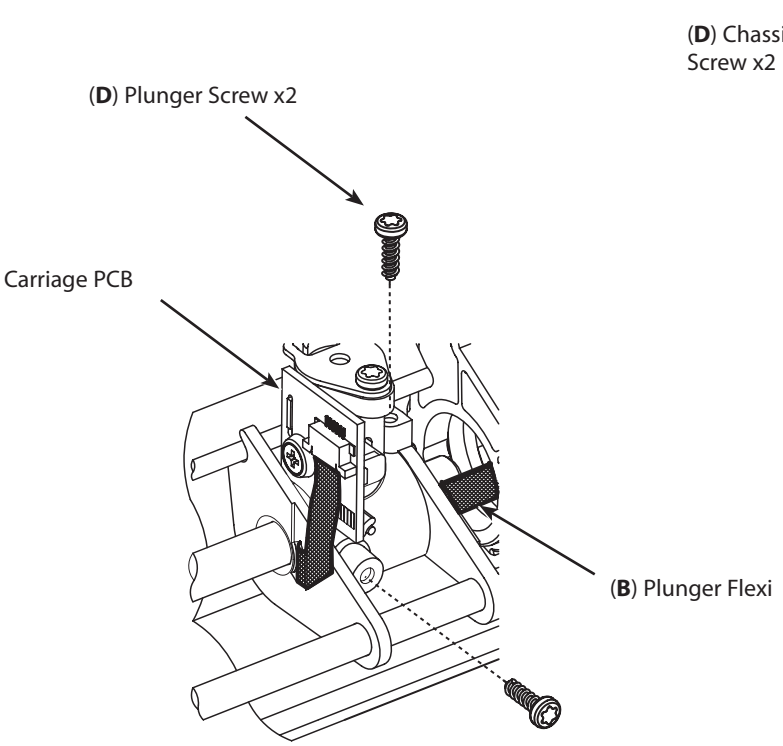
Item	Description	Part Number
A	ASENA GS, Display PCB	1000SP01118
B	ASENA GH/CC/TIVA, Display PCB	1000SP01119
C	Adaptor GS Display MkII Asena	1000ME01500
D	ASENA SP, Assy, Bracket Display Mounting	1000ME00261
E	Pad Self-adhesive Double-sided 12x12mm	0000ME00423 (not shown on back of Display PCB)
F	ASENA GS, Assy, Display Insulator	1000SP00187
G	ASENA GH/CC/TIVA, Assy, Display Insulator	1000SP00188
H	ASENA SP, Assy, Gasket Display	1000ME01301
I	ASENA GH/CC/TIVA, Kit, Display Protection	1000SP01137 (not shown on back of Display PCB)
J	ASENA GS, Kit, Backlight Shield	1000SP00273
K	ASENA SP, Kit, Fixings (screws, washers etc)	1000SP00466

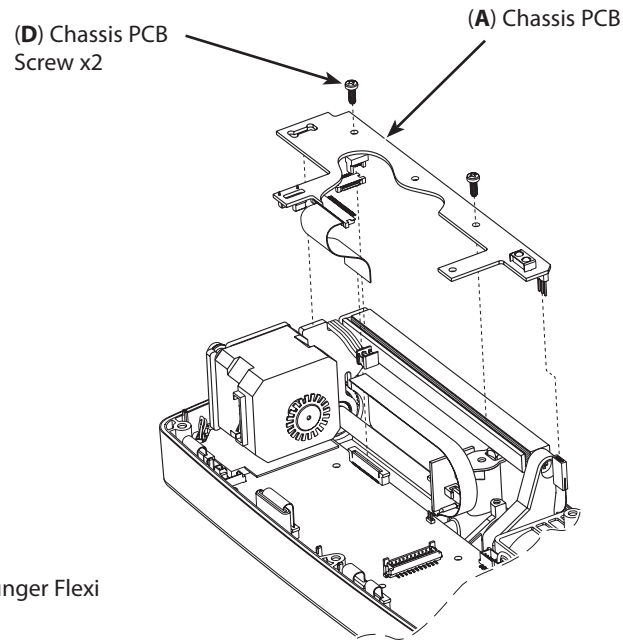
Front case and subassemblies *(continued)*

Front case – Chassis PCB and Plunger assembly

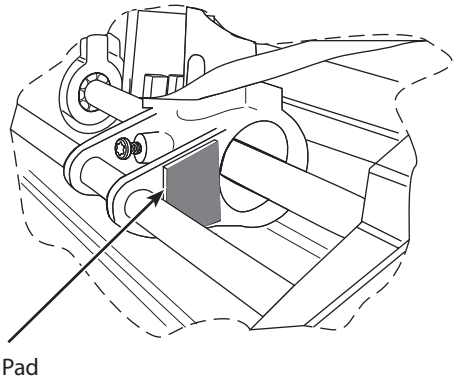
Replacement Procedure

1. Remove the two Chassis PCB screws. Disconnect all cables.
2. Extend the plunger out to its full extent and fully loosen the two plunger retaining screws in the carriage.
3. Carefully remove the plunger flexi from the carriage PCB and straighten. While applying controlled force to the plunger, extract it from the carriage and withdraw it completely.
4. Reassemble in reverse order.





Check Buffer Pad fitted if serial numbers are within either of the ranges 8001-03468 & below or 8002-06788 & below. If not fitted, clean the surface of the carriage face nearest the plunger drive tube and fit Buffer Pad in the position shown (sloping edge to match carriage profile, see diagram).



Spare Parts

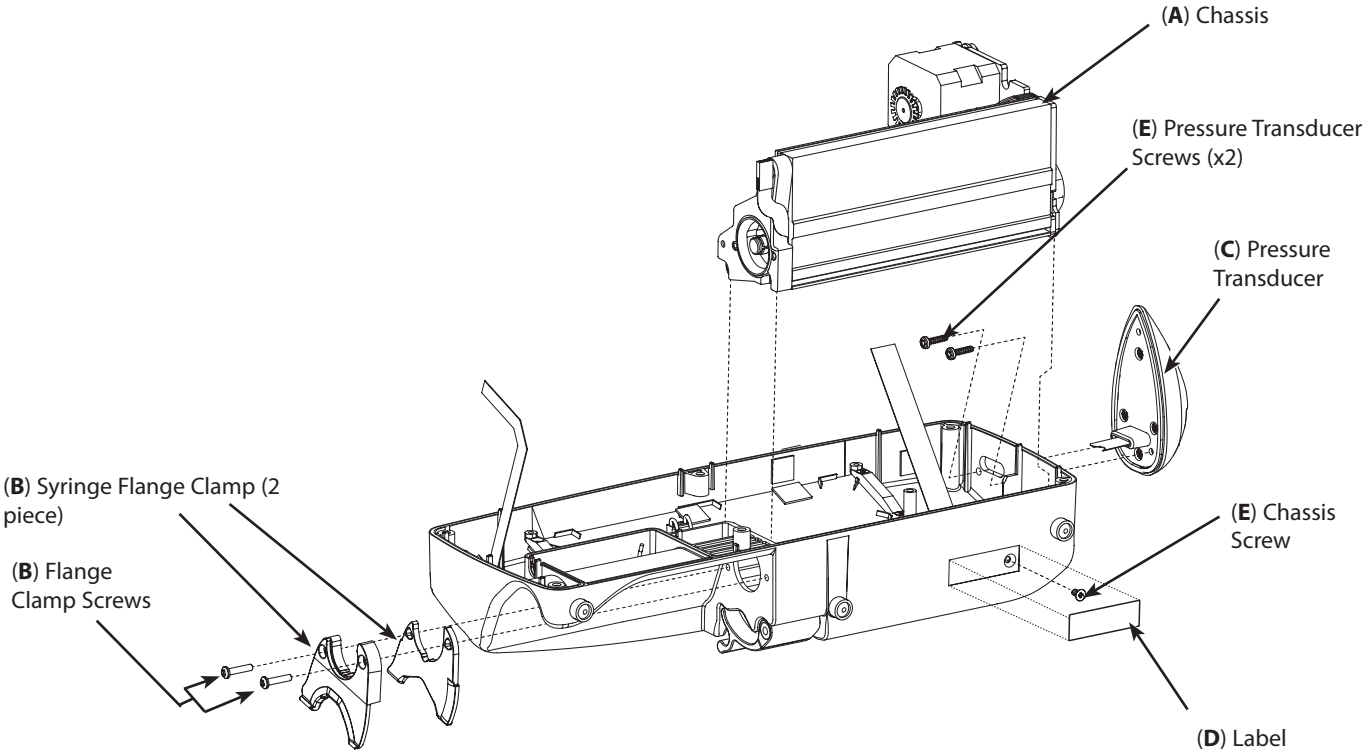
Item	Description	Part Number
A	ASENA SP, Kit, Chassis PCB	1000SP00189
B	ASENA SP, Kit, Plunger assembly (not shown)	1000SP01113
C	ASENA SP, Kit, Carriage buffer	1000SP00230
D	ASENA SP, Kit, Fixings (screws, washers etc)	1000SP00466

Front case and subassemblies *(continued)*

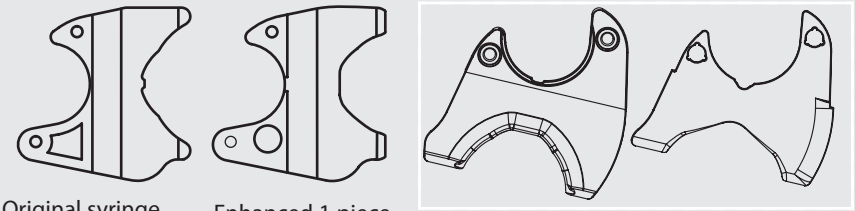
Chassis assembly and Pressure Transducer (Model CC only)

Replacement Procedure

1. Carefully peel away the label on the bottom of the front case to gain access to the chassis screw. Remove this screw.
2. Remove the two screws securing the syringe flange clamp.
3. Carefully withdraw the chassis.
4. Remove the two screws from the pressure transducer assembly and carefully withdraw (Model CC only).
5. Reassemble in reverse order.



Syringe Flange Clamp has been enhanced in response to market feedback indicating under certain conditions, false error alarms may occur on the pump close to the End of Infusion (EOI) particularly when syringes of small sizes are used (5,10ml etc.) if incorrectly fitted to the pump.
Fit Enhanced 1 piece Syringe Flange Clamp if serial numbers are within either of the ranges 8001-02315 & below or 8002-04311 & below.
Alternatively the latest 2 piece Syringe Flange Clamp may be fitted if the pump is required to have an EOI point below 5%. Pump must have software versions v1.8.1 or higher if fitting the 2 piece Syringe Flange Clamp.



Original syringe flange clamp

Enhanced 1 piece syringe flange clamp

Enhanced 2 piece syringe flange clamp

Spare Parts

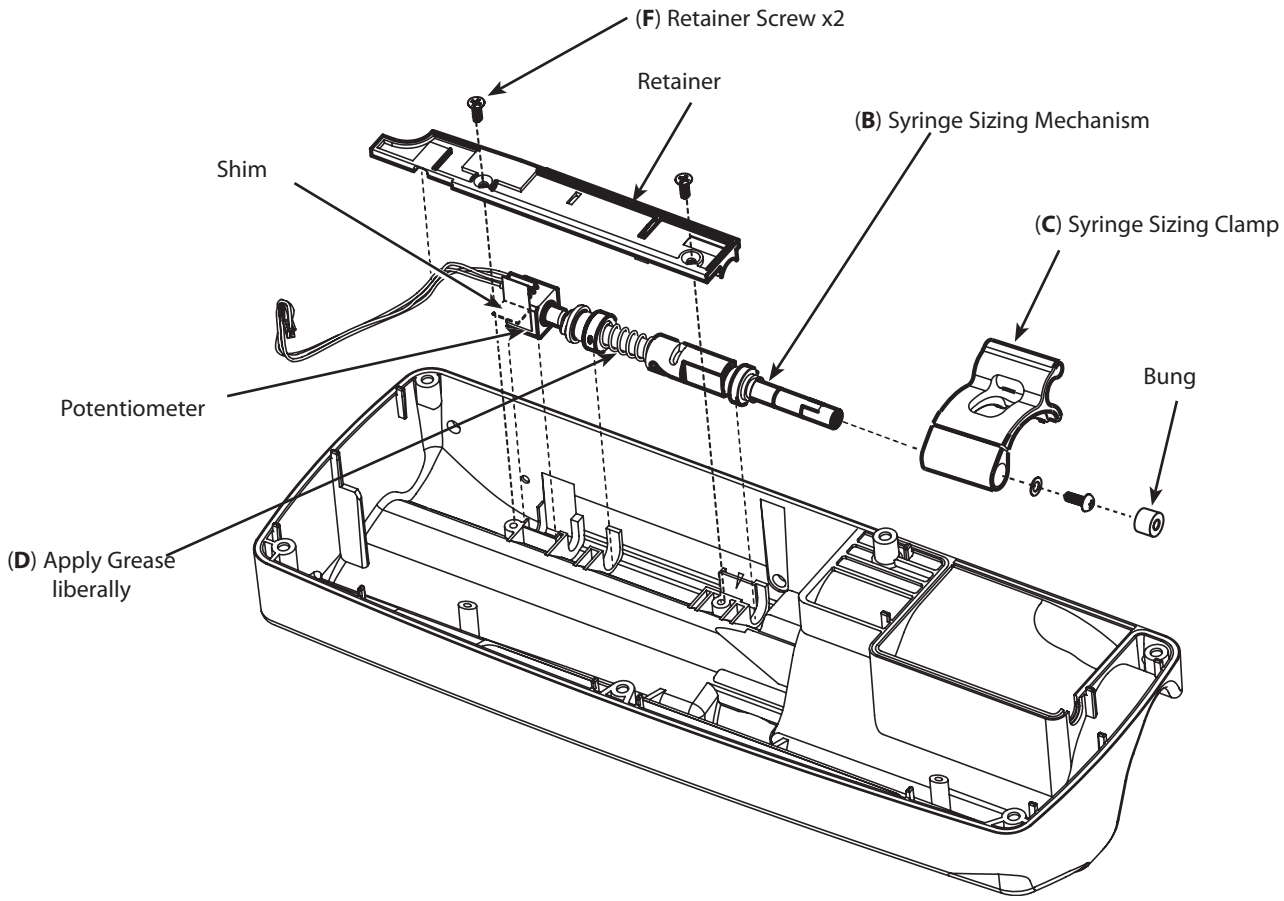
Item	Description	Part Number
A	ASENA SP, Kit, Chassis Assembly	1000SP01112
B	ASENA SP, Kit, Syringe Flange Clamps (1 piece)	1000SP00577
B	ASENA SP, Kit, Syringe Flange Clamps (2 piece)	1000SP00570
C	ASENA CC, Kit, Pressure Transducer	1000SP01155
D	ASENA SP, LBL, Label Chassis Screw Cover	1000LB00431
E	ASENA SP, Kit, Fixings (screws, washers etc)	1000SP00466

Front case and subassemblies *(continued)*

Front case – Syringe Sizing assembly

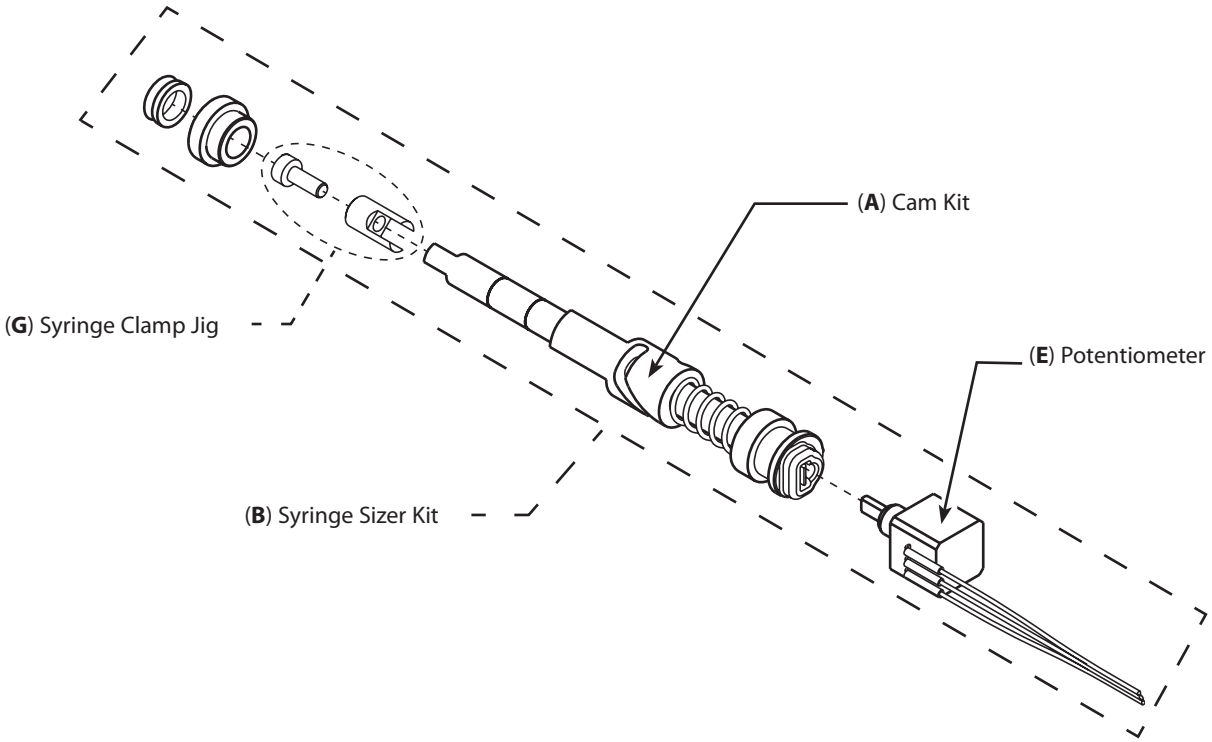
Replacement Procedure

1. Remove the syringe sizing retainer screws, case brace and retainer.
2. Remove the shim and discard, then lever the syringe sizing mechanism from the housing and withdraw the potentiometer.
3. Pull the syringe clamp back to its full extent. Carefully remove the bung, screw and washer. Pull hard on the syringe clamp to remove.
4. Carefully lever the syringe sizing mechanism from the housing and pull through the case. Remove the shaft bearing and the v-ring seal.
5. Secure the assembly loading jig to the syringe sizing mechanism. Fit the shaft bearing and v-ring seal onto the end of the jig.
6. Lay the assembly on one side, potentiometer to the left, wires exiting upwards. The injection 'pip' feature on the pre-moulded shaft should be visible.



7. Fit the seal protector into the upper case and load the syringe sizing mechanism. Compress the v-seal against the protector.
8. Withdraw the protector and push the syringe sizing mechanism through the hole in the front case until the flat sides locate in the case and the potentiometer aligns with the case recess. Ensure the moulding pip is located on the side.
9. Slide the shim component down the side wall of the syringe potentiometer recess. Bend the shim 'outward'.
10. Fit the syringe sizing retainer so that the shim is visible protruding from the retainer. Fit the case brace. Secure with two screws.
11. Remove the assembly loading jig.
12. The syringe shaft flats to be moved into the open position.
13. Fit the syringe clamp over the shaft, fit the screw, washer and bung into the shaft end.

Front case and subassemblies *(continued)*



Check for presence of shim. If shim is not fitted, or the cam has sharp edges, fit the Cam Kit on reassembly. If the cam has sharp edges or the shim is folded incorrectly, these may cause excessive wear of areas around the front case. Mechanical movement and small changes in the syringe diameter can result in a syringe detect failure, which may occur if shim is not present or case is worn.

If pump has serial numbers within either of the ranges 8001-02574 & below or 8002-04778 & below fit enhanced syringe clamp 1000SP01123 on reassembly. Old syringe clamps can be recognised as clear plastic; new syringe clamps are solid blue plastic. Old syringe clamps may crack and fail after being subjected to Isopropyl alcohol used in the cleaning process.

Replace the foot last if replacing the case. If fitting a new syringe sizing mechanism, apply generous amounts of grease (CASTROL LMX) to the slot of the mechanism and lightly grease the v-seal.

Spare Parts

Item	Description	Part Number
A	ASENA SP, Kit, CAM Kit	1000SP00170
B	ASENA SP, Kit, Syringe Sizer (see previous page)	1000SP01116
C	ASENA SP, Kit, Syringe & Flange Clamps (see previous page)	1000SP01123
D	ASENA Kit Grease LMX	1000SP01144
E	ASENA SP, Assy, Syringe Size Potentiometer	1000SP01125
F	ASENA SP, Kit, Fixings (screws, washers etc)	1000SP00466
G	ASENA SP, Test, Syringe Clamp Jig	1000SP00481

Front case and subassemblies *(continued)*

Chassis assembly breakdown

Replacement Procedure

1 Remove the pulley nut, washers and withdraw the pulley and toothed belt.

2 Remove three screws securing stepper motor.

3. Remove the leadscrew by driving out the roll pin using a suitable punch.

4. Remove three screws securing motor plate.

5. Remove three screws securing bearing block.

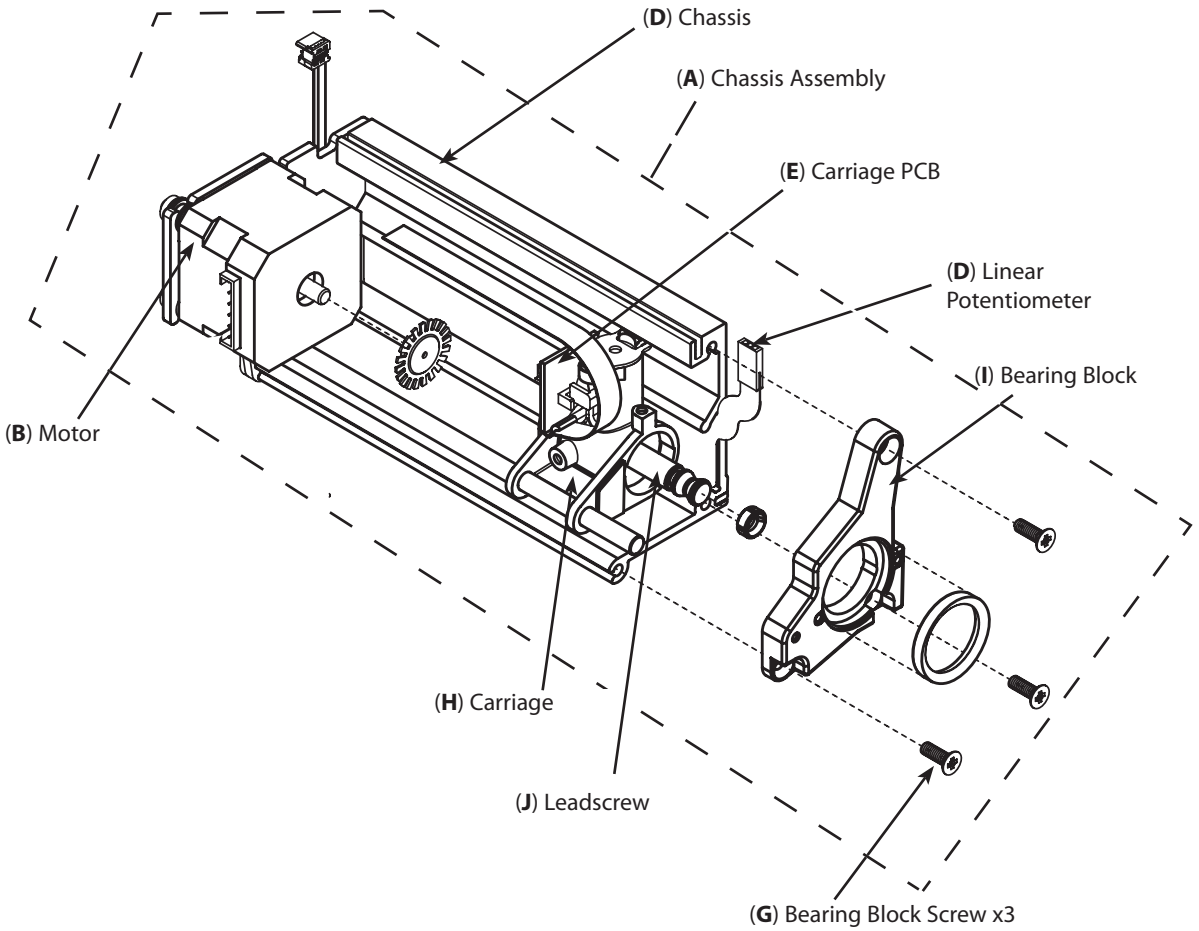
6. Refit plunger into carriage, declutch plunger and withdraw plunger and carriage. Hold linear potentiometer actuator and spring on the side of the carriage.

7. Remove one screw holding carriage PCB.

8. Remove the linear travel potentiometer.

9. Fit new linear potentiometer to centre area of chassis and flush to rear of chassis slot and flush to motor-plate end.

10. Reassemble in reverse order



There are 2 different chassis assemblies available therefore before fitting a replacement chassis assembly check software version to ensure fitting the correct part, see table below. Control PCB assembly numbers are supplied for reference when the software is inaccessible.

Chassis Part Number	*Mark*	*Software version*	*Control PCB assembly number*
1000SP01136	*MkI & MkII*	*V1.x.x*	*8000EL00008 & 8000EL00070*
1000SP01328	*MkIII*	*V2.x.x & above*	*8000EL00100*

Front case and subassemblies *(continued)*

Chassis assembly breakdown (continued)

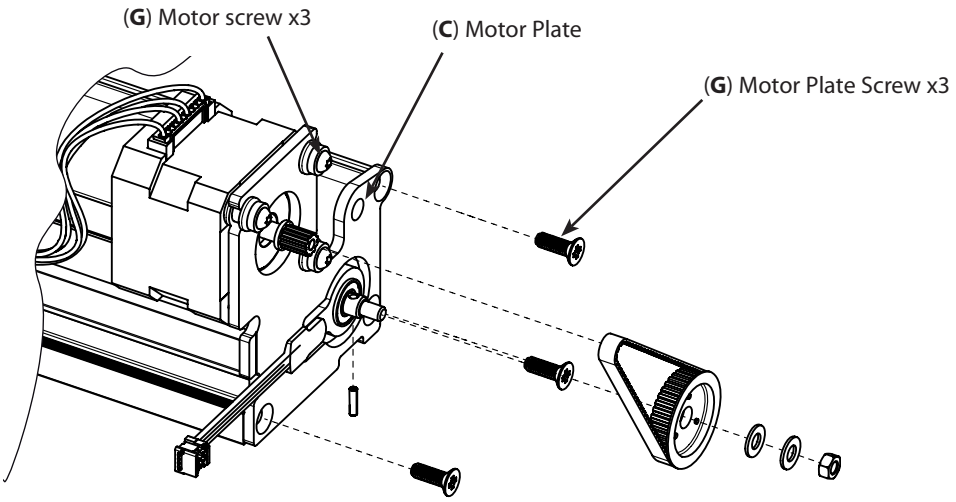


Figure 1 - Current Motor Plate

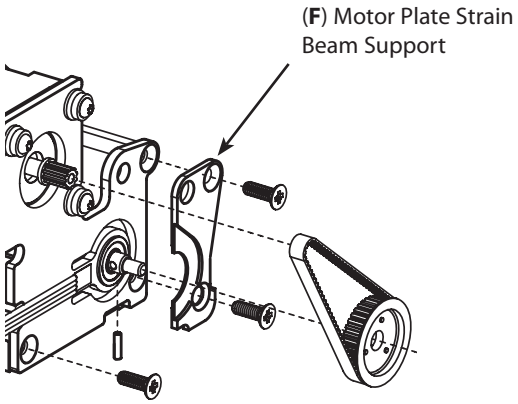


Figure 2 - Motor Plate Strain Beam Support

Check Motor Plate serial code, if the code begins with "PH", e.g. PHDA 123, then this is the current version (see Figure 1) and does not require a Motor Plate Strain Beam Support.
All previous version Motor Plates require a Motor Plate Strain Beam Support fitted in position shown (see Figure 2) if not fitted.

Spare Parts

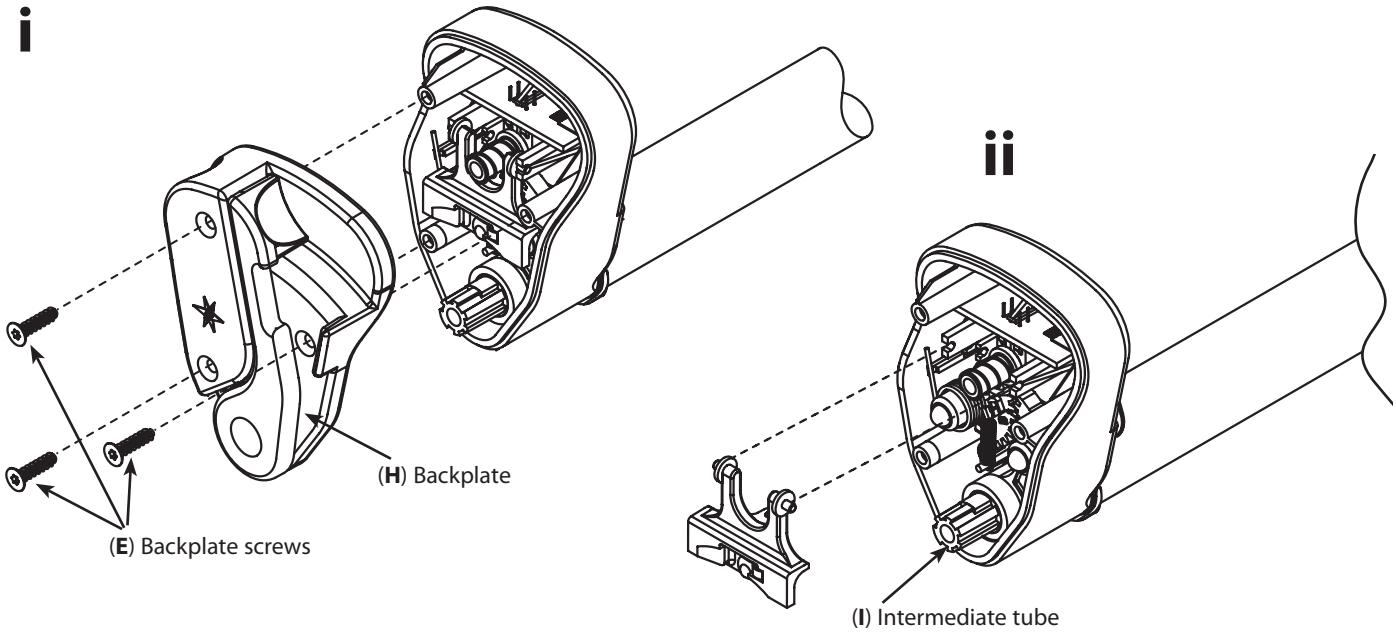
Item	Description	Part Number
A	ASENA SP, Kit, Chassis Assembly	1000SP01112
B	ASENA SP, Kit, Stepper Motor	1000SP01109
C	ASENA SP, Kit, Motor Plate	1000SP01110
D	ASENA SP, Kit, Chassis Enhancement (MkI & MkII)	1000SP01136
D	ASENA SP, Kit, Chassis Enhancement MkIII Kit	1000SP01328
E	ASENA SP, Carriage PCB	8000EL00022
F	SP Kit Motor Plate Strain Beam Support	1000SP00408
G	ASENA SP, Kit, Fixings (screws, washers etc)	1000SP00466
H	Spare Carriage Asena	1000SP01107
I	Spare Bearing Block Asena (P8)	1000SP01111
J	Alaris SP leadscrew kit	1000SP01327

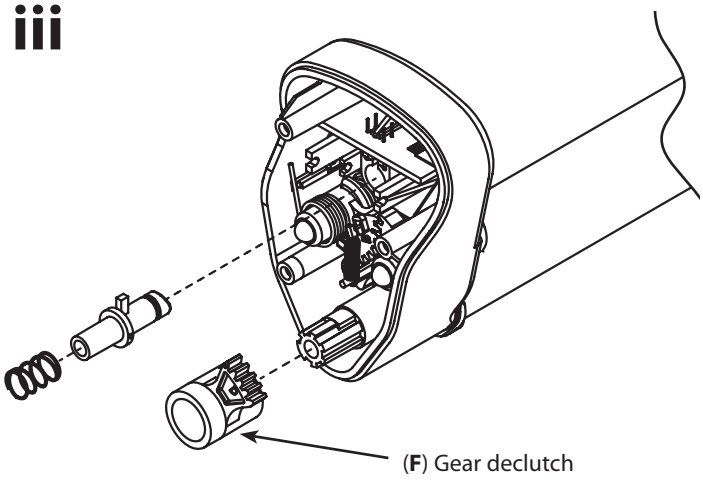
Front case and subassemblies *(continued)*

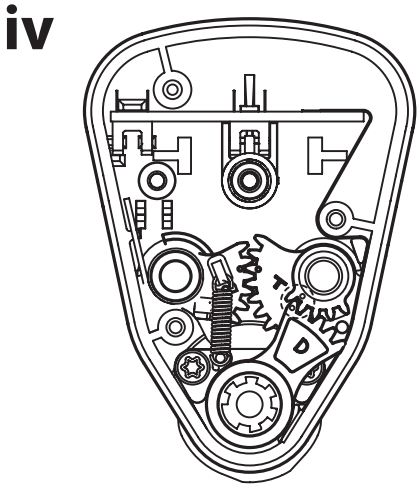
Plunger assembly breakdown

Replacement Procedure

1. Remove three screws holding plunger backplate.
2. Remove components as required. Follow diagrams step ii to step ix.
3. Reassemble in reverse order.







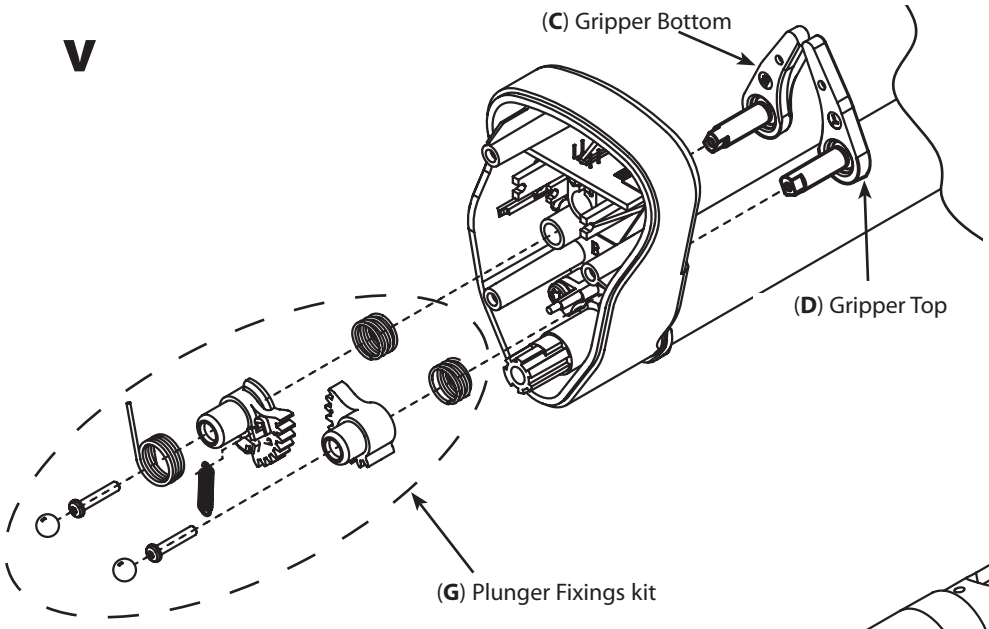
Spare Parts

Item	Description	Part Number
A	ASENA SP, Kit, Plunger Assembly (Complete Plunger Assembly, not shown)	1000SP01113
B	ASENA SP, Plunger Detect PCB	8000EL00019
C	ASENA SP, Gripper Bottom	1000ME01218
D	ASENA SP, Gripper Top	1000ME01219
E	ASENA SP, Kit, Fixings (screws, washers etc)	1000SP00466
F	GEAR DECLUTCH	1000ME01198
G	Alaris SP plunger fixings kit	1000SP01320
H	Alaris SP Plunger back plate kit	1000SP01321
I	Alaris SP Intermediate tube kit	1000SP01322

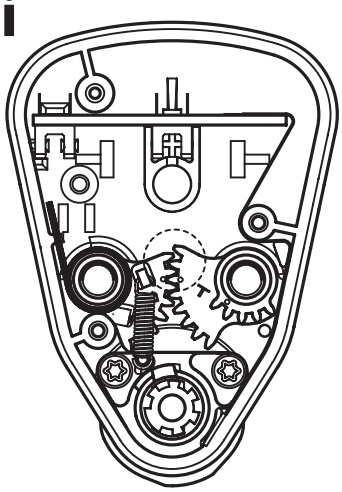
Front case and subassemblies *(continued)*

Plunger assembly breakdown (continued)

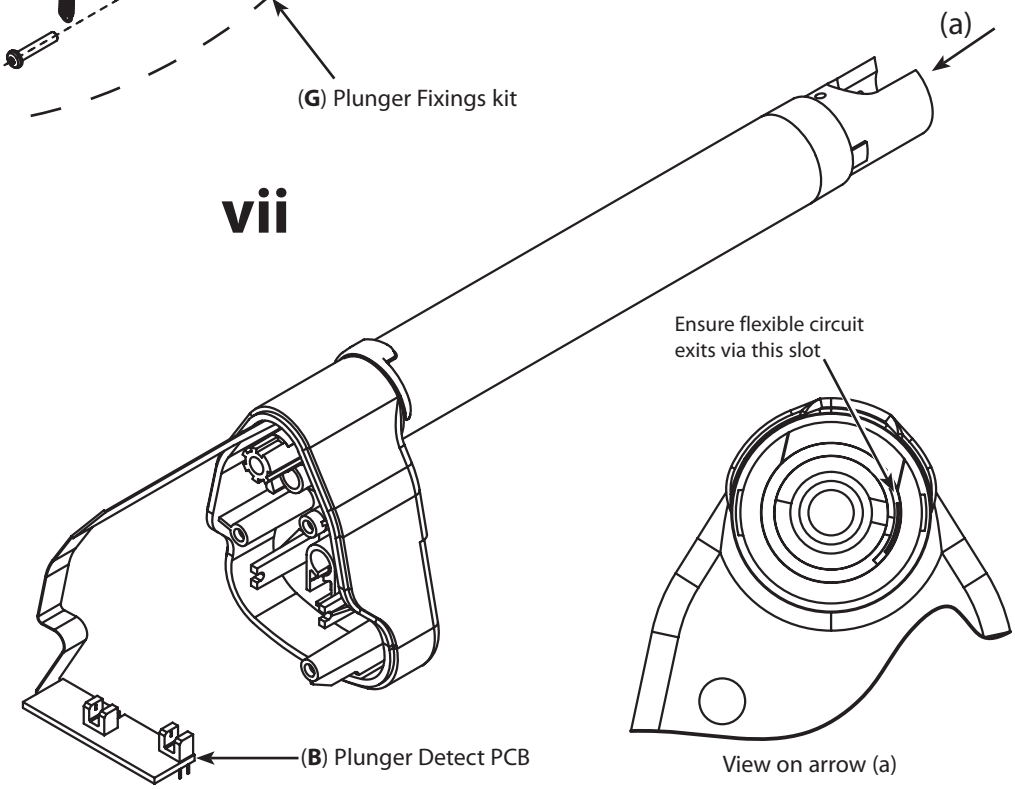
v



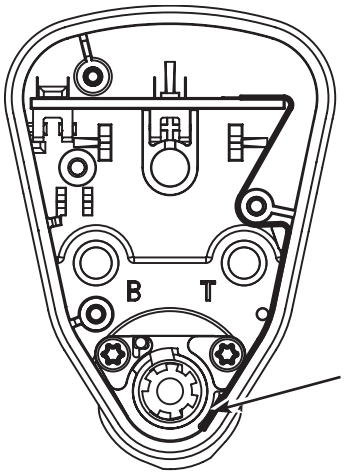
vi



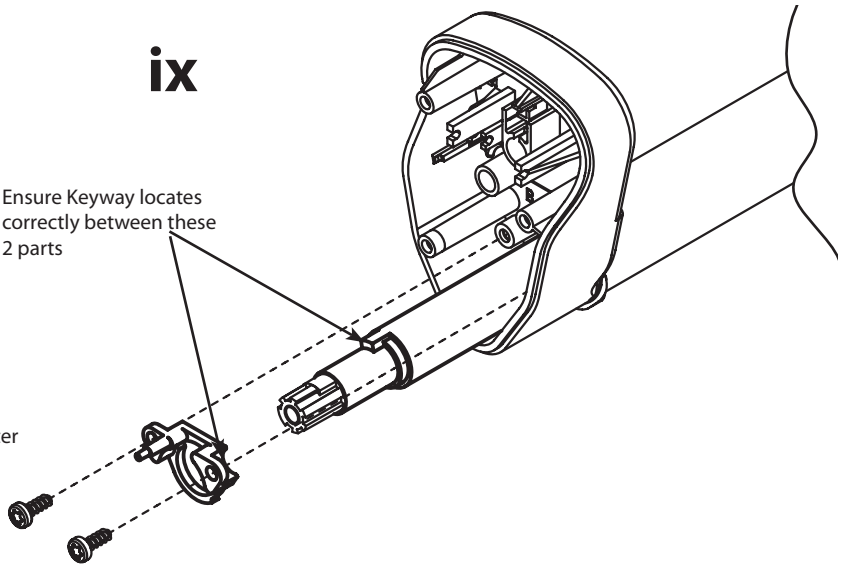
vii



viii



ix

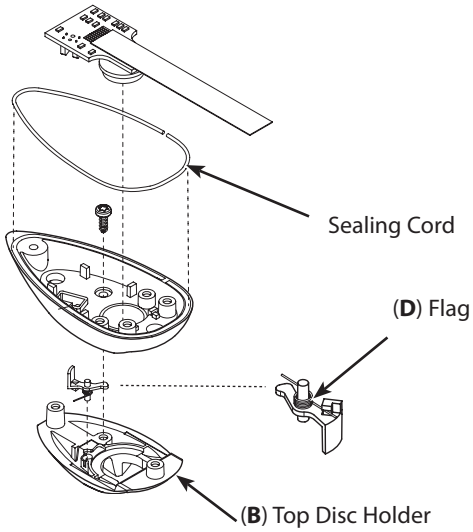


Pressure Transducer Assembly (Model CC only)

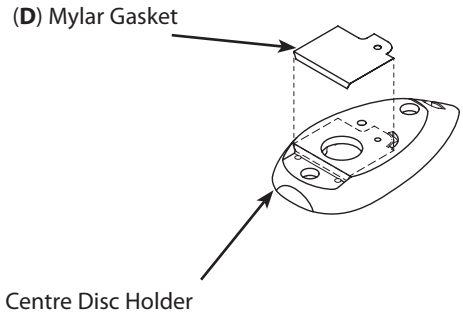
The following instructions detail the fitting of the Pressure Transducer Assembly.

Replacement Procedure

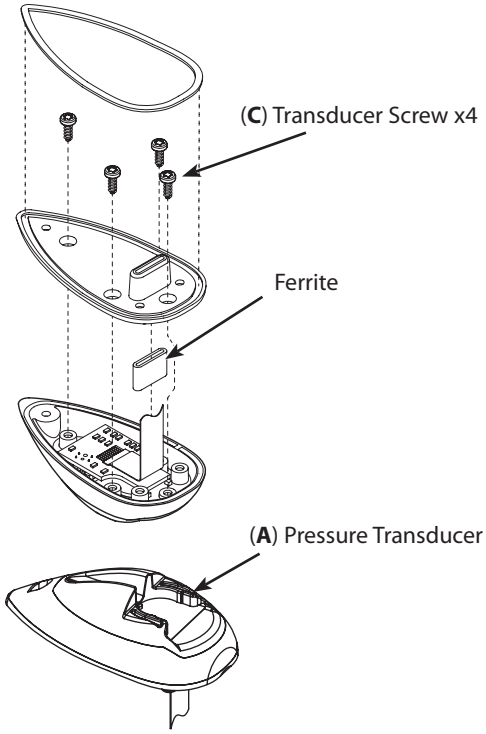
1. Fit the mylar gasket.
2. Align the hole in the gasket with the hole in the centre disc holder and ensure label is square to the Centre Disc Holder.
3. Use a clean wipe and apply pressure to the mylar gasket.
4. Crease the mylar gasket along the ledge of the centre disc holder and ensure it is well adhered along the front face of the step edge.
5. Load the spring onto the disc-detect flag shaft.
6. Locate spring arms to spring retainer on the flag and to the recess in the disc holder top.



13. Slide the flexible circuit ferrite into place and ensure the flexible circuit is formed at 90° to the PCB.
14. Lower the Base Disc Holder onto the Centre Disc Holder.
15. Secure the base with the screws.
16. Use a lint-free cloth and approved cleaner to wipe the surface clean.
17. Start the gasket at the pointed end. Work around the perimeter and minimise the gap at the join (if using cord - N/A if using single-piece gasket).



7. Rotate and install the plastic flag.
8. Fit the sealing cord starting at the break bar.
9. Load the disc holder centre onto the disc holder top.
10. Secure disc holder centre to disc holder top using screw.
11. Load pressure transducer into assembled housing.
12. Once the PCB is located, apply pressure over the sensor area of the PCB to ensure good location.



Spare Parts

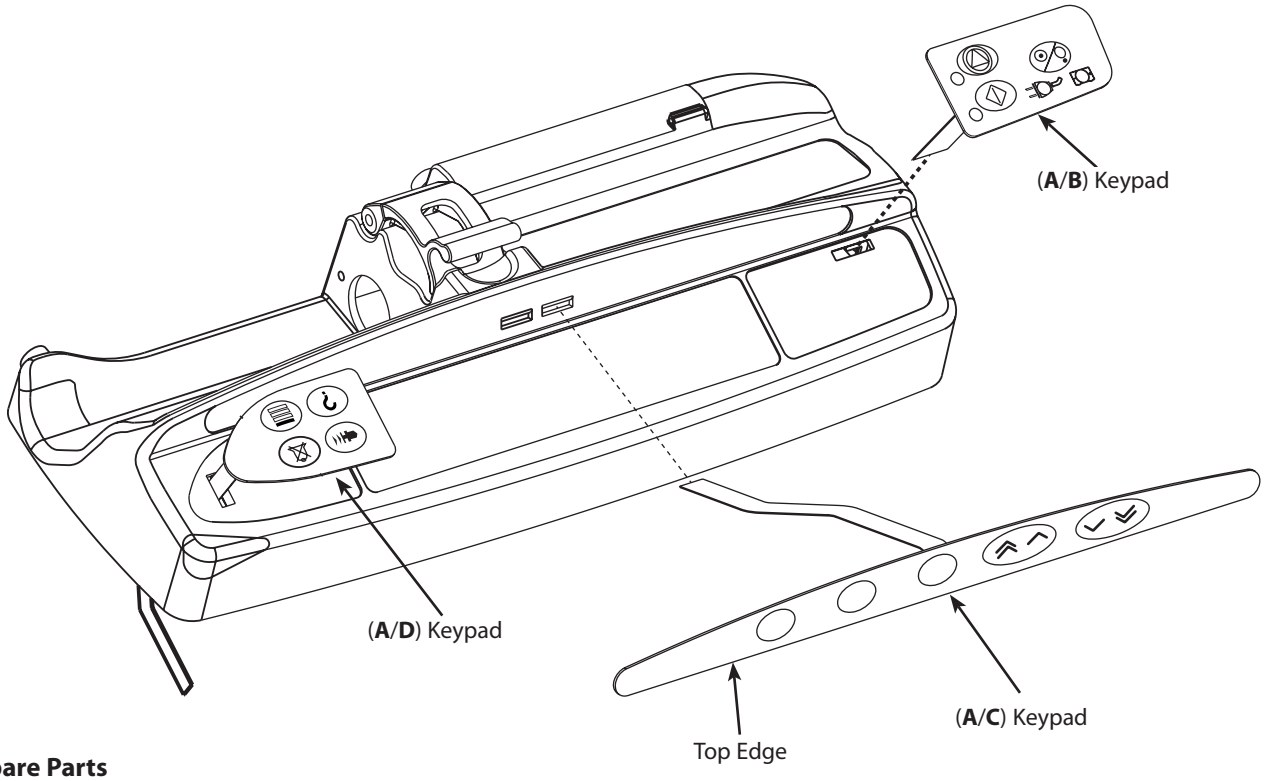
Item	Description	Part Number
A	ASENA CC, Kit, Pressure Transducer	1000SP01155
B	ASENA CC, Assy, Top Disc Holder	1000ME00450
C	ASENA SP, Kit, Fixings (screws, washers etc)	1000SP00466
D	Alaris SP CC disc detect parts kit	1000SP01326

Keypads and labels

Replacement Procedure

1. Discard any keypads removed as they cannot be reused.
2. Ensure all residual adhesive is removed from bonding surfaces.
3. Fit replacement keypads after removing backing paper from underside. Handle replacement keypads carefully to avoid damage.
4. Apply finger pressure to keypads working from one end, to drive the air out of the adhesive/case interface.
5. Remove label(s) from case as required.
6. Clean case where replacement label(s) to be fitted.
7. Fit replacement label(s) taken from label sheet as required.
8. Ensure all keypad membrane flexi tails are routed and secured with double sided adhesive pads (0000ME00423).

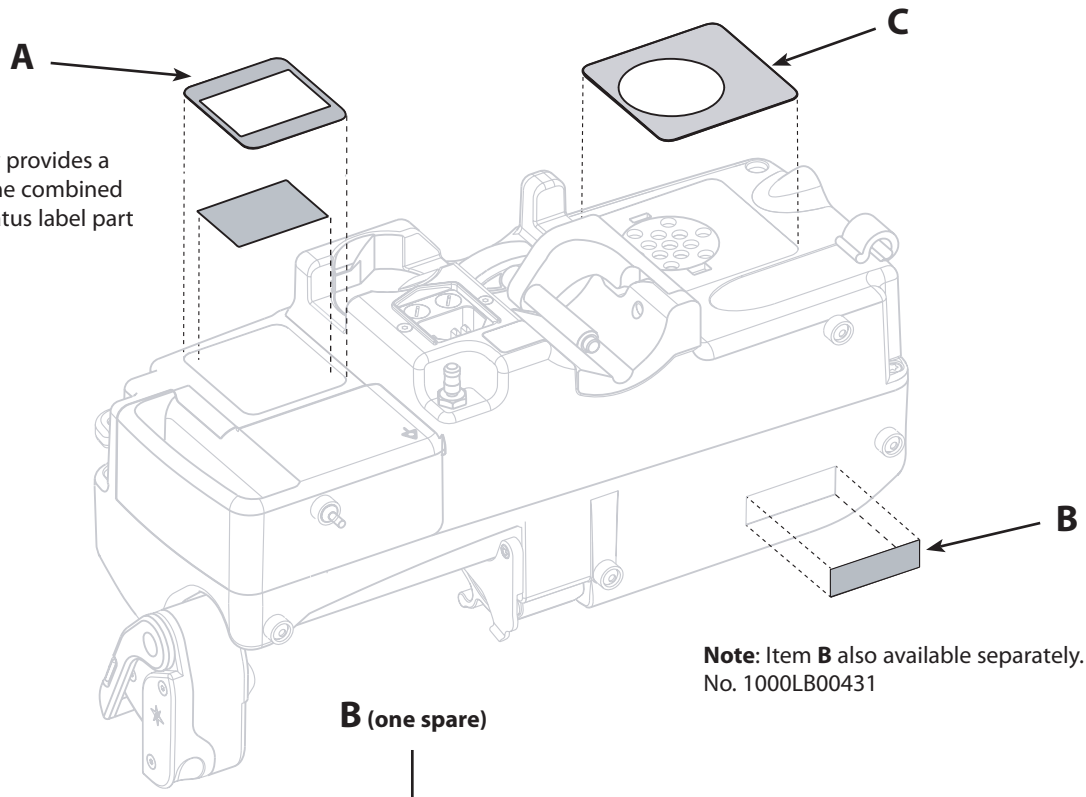
To ensure an effective case fluid seal, ensure the top 5mm edge of the shelf keypad is given careful attention as described in step 4 above.



Spare Parts

Item	Description	Part Number
A	ASENA GH/CC, Key, Switch Overlay Keypad	1000SP01126
	ASENA GS, Key, Switch Overlay Keypad	1000SP01127
	ASENA TIVA, Key, Switch Overlay Keypad	1000SP00403
	ASENA PK, Key, Switch Overlay Keypad	1000SP01203
B	Keypad Asena SP On/Off	1000LB00625
	Asena PK Keypad - On/Off BOM	1000LB01405
C	Keypad Asena GH Shelf	1000LB00626
	Asena PK Keypad - Shelf- BOM	1000LB01404
	Keypad Asena GS Shelf	1000LB00628
D	Keypad Asena GH Options	1000LB00627
	Asena PK Keypad - Options - BOM	1000LB01403
	Keypad Asena GS Options	1000LB00629
	Keypad Asena TIVA Options	1000LB00630

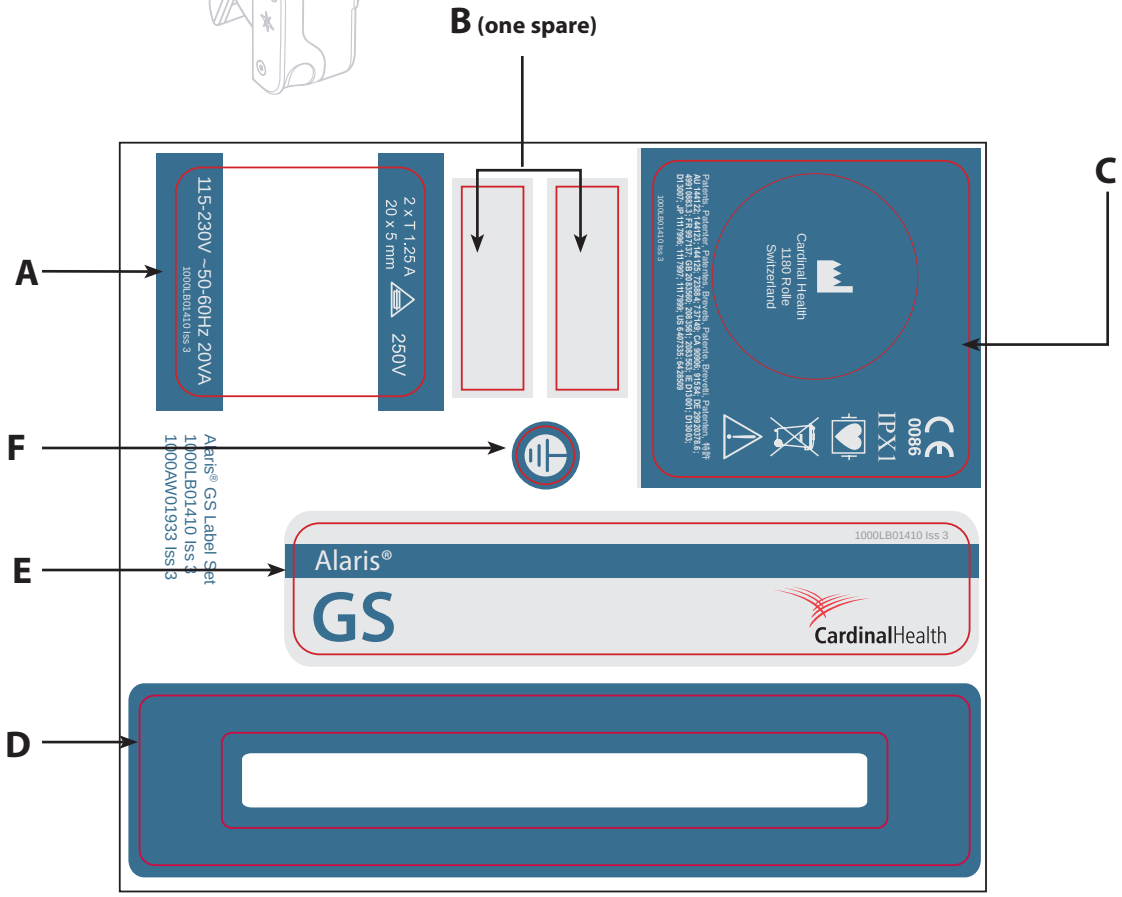
Keypads and labels *(continued)*



Note:

Item **A** additionally provides a clear window for the combined serial number & status label part nr. 1000LB00590.

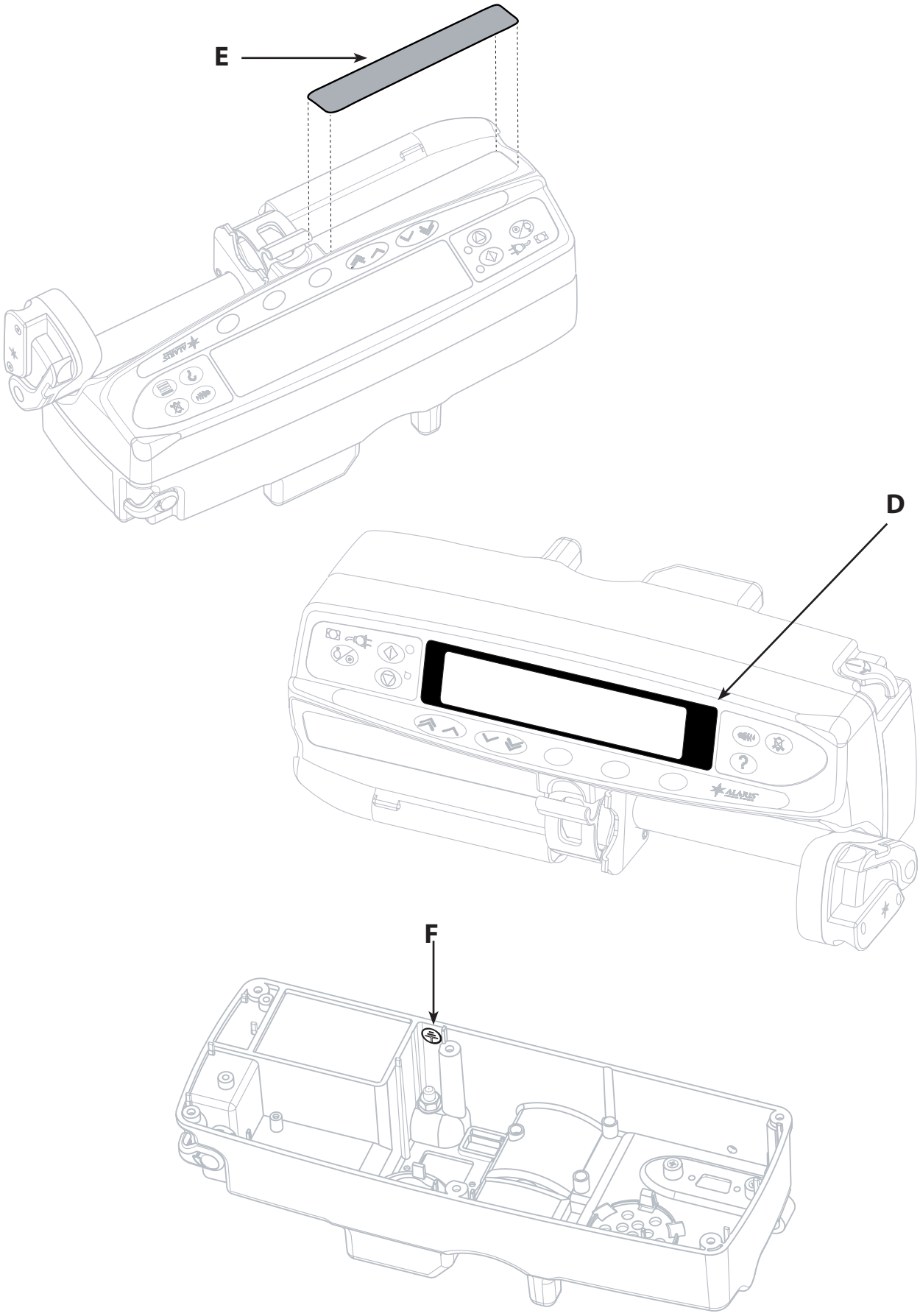
Note: Item **B** also available separately. Part No. 1000LB00431



Picture shows Alaris® GS Syringe Pump Label Set. Refer to the following model types for correct label set.

Description	Part Number
LABEL SET CC SYRINGE PUMP	1000LB01408
LABEL SET GH SYRINGE PUMP	1000LB01409
LABEL SET GS SYRINGE PUMP	1000LB01410
LABEL SET TIVA SYRINGE PUMP	1000LB01411
LABEL SET PK SYRINGE PUMP	1000LB01414

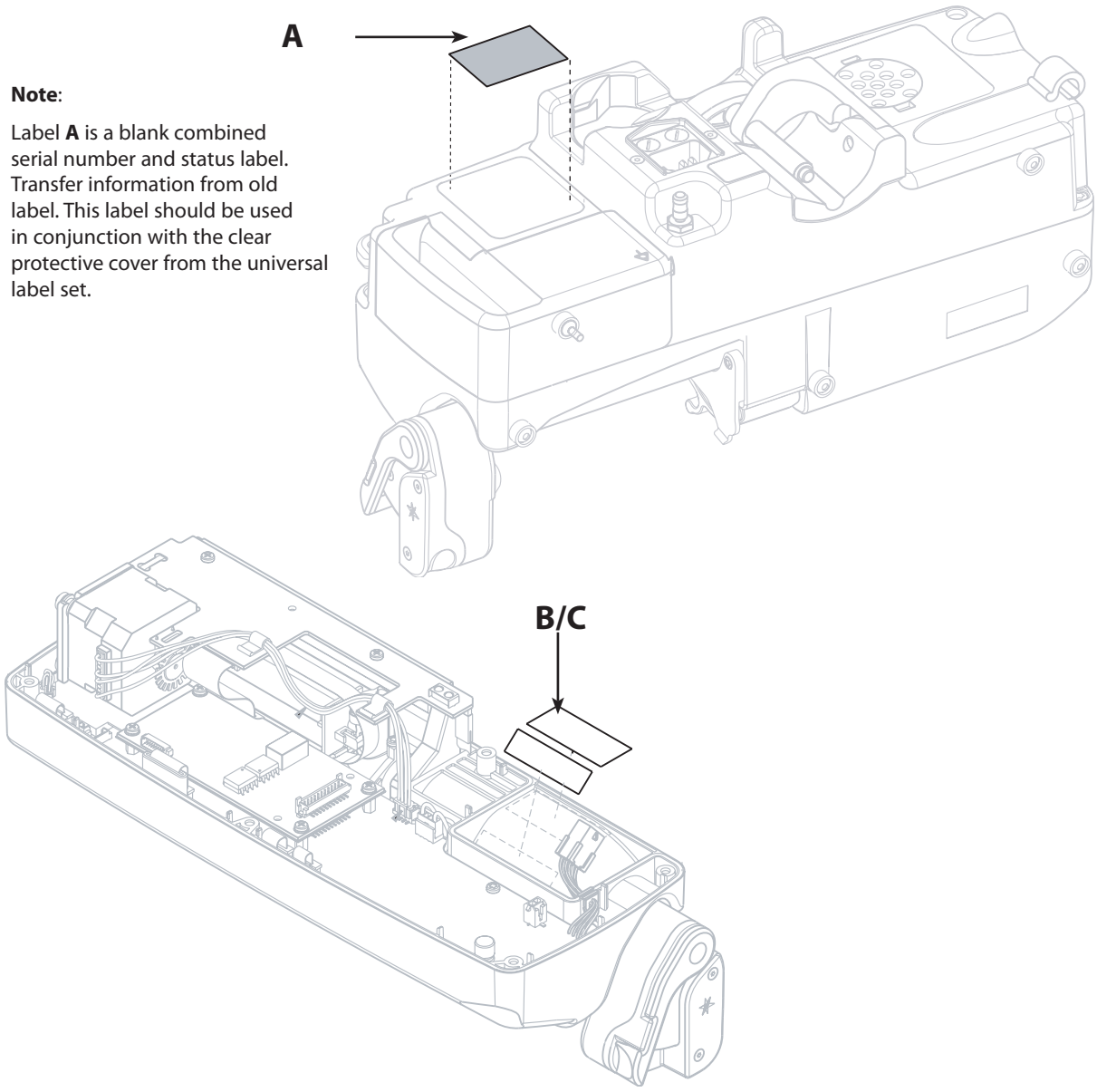
Keypads and labels *(continued)*



Keypads and labels *(continued)*

Note:

Label **A** is a blank combined serial number and status label. Transfer information from old label. This label should be used in conjunction with the clear protective cover from the universal label set.



The picture above shows the label set that is available as a separate item from the standard Alaris® Syringe Pump label sets.

Item	Description	Part Number
ABC	Instrument Label 1″x1 1/2″	1000LB00590 Use in conjunction with universal label set.

Appendix A

Specifications

In this appendix

Infusion	**63**
Electrical	**64**
Physical	**64**
Environmental	**64**
Electromagnetic Compatibility	**65**

To be used for reference only, for more detailed specifications refer to relevant Directions For Use. These specifications refer to all models covered by this manual unless otherwise stated.

Infusion

Infusion rate (ml/h)	Models **GH/CC/TIVA/PK**	Model **GS**
5ml syringes	0.1 - 150	0.1 - 150
10ml syringes	0.1 - 300	0.1 - 200
20ml syringes	0.1 - 600	0.1 - 200
30ml syringes	0.1 - 900	0.1 - 200
50ml syringes	0.1 - 1200	0.1 - 200

Volume Infused 0.0 - 9990ml

Bolus rate (ml/h)	Models **GH/CC/PK**	Model **GS**	Model **TIVA**
5ml syringes	10 - 150	10 - 150	150
10ml syringes	10 - 300	10 - 300	150, 300
20ml syringes	10 - 600	10 - 500	150, 300 or 600
30ml syringes	10 - 900	10 - 500	150, 300, 600 or 900
50ml syringes	10 - 1200	10 - 500	150, 300, 600, 900 or 1200

Bolus volume limit 0.5 (0.1ml - v2.3.x & above or v1.9.x); - 25.0ml
Purge rate (ml/h) 100 - 500
Purge volume 0.5 - 5ml

During PURGE/BOLUS the pressure limit alarms are temporarily increased to the maximum settings level.

Keep Vein Open (KVO) rate 0.1ml/h - 2.5ml/h
End Of Syringe rate Stop, KVO (0.1ml/h to 2.5ml/h), or set rate if lower than KVO.
Volume To Be Infused (VTBI) 0.1ml - 1 00ml (0.1ml - 1000ml - v2.3.x & above or v1.9.x),, 1min - 24h
*(*Models *CC/GH)*
VTBI done rate (Models **CC/GH)** Stop, KVO (0.1ml/h to 2.5ml/h), set rate if lower than KVO or continue at set rate.
Near End Of Infusion alarm 1min - 15min to end of infusion, or 10% of syringe volume, whichever is smaller.
End Of Infusion (EOI) alarm 0.1% - 5% of syringe volume.
Pumping pressure limit L-1 to L-10 (100mmHg to 1000mmHg approx)
L-0 (50mmHg approx)

Occlusion accuracy with pressure set (% of full scale) (Model **CC):**

Pressure (mmHg)	**0**	**25**	**500**	**1000**
At 23°C	±2%	±4%	±5%	±6%
Between 5°C and 40°C ±4%	±7%	±7%	±10%	

System accuracy Volumetric Mean ± 2% (nominal)

Electrical

Battery type	NiMH sealed rechargeable 7.2V/2.7Ah.
Battery life	Typically 4h from fully charged @ 5.0ml/h & 20ºC under nominal conditions.
Battery charging	2.5h from fully discharged to 90% charged.
Fuse type	2 x T-1.25A, slow blow.
AC power supply	115/230VAC, 50/60Hz, 20VA (nominal).
Electrical safety	Class I Type CF.

Physical

Weight 2.7 kg (excluding power cable)

Dimensions

Models	W	H	D
GS/GH/PK	310mm	121mm	200mm
CC	335mm	121mm	200mm
TIVA	310mm	121mm	200mm

Latex The Alaris® Syringe Pump range does not contain any Latex.

Environmental

IPX Rating IPX1

Operating limits

Temperature	+5°C to +40°C
Relative humidity	20% to 90%
Atmospheric pressure	700hPa to 1060hPa

Transport limits

Temperature	-30°C to +50°C
Relative humidity	10% to 95%
Atmospheric pressure	500hPa to 1060hPa

Electromagnetic Compatibility

Warning:

- The use of any accessory, transducer, or cable with the Alaris® Syringe Pump other than those specified may result in increased emissions or decreased immunity of the pump.
- The Alaris® Syringe Pump should not be used adjacent to or stacked with other equipment, however if adjacent or stacked use is necessary, the Alaris® Syringe Pump should be observed to verify normal operation in the configuration in which it will be used.

Caution:

- The Alaris® Syringe Pump is a CISPR 11 Group 1 Class A Medical Equipment System and intended for use by healthcare professionals only.
- Medical Electrical Equipment needs special precautions regarding EMC and needs to be installed, put into service and used according to the EMC information provided in the accompanying documents.
- Portable and Mobile RF communications can affect Medical Electrical Equipment.
- Operating the pump near equipment which radiates high energy radio frequencies (electro surgical or cauterizing equipment, portable radios, cellular telephones, etc.) may cause false alarm conditions. If this happens, reposition the pump away from the source of interference or turn off the pump and manually regulate the flow.

<table>
<tr><th colspan="3">Guidance and Manufacturer's Declaration – Electromagnetic Emissions</th></tr>
<tr><td colspan="3">The Alaris® Syringe Pump is intended for use in the electromagnetic environment specified below.
The customer or the user of the Alaris® Syringe Pump should assure that it is used in such an environment.</td></tr>
<tr><th>Emissions Test</th><th>Compliance</th><th>Electromagnetic Environment – Guidance</th></tr>
<tr><td>CISPR 11
RF Emissions</td><td>Group 1</td><td>The pump uses RF energy only for its internal function in the normal product offering. Therefore, its RF emissions are very low and are not likely to cause any interface in nearby electronic equipment.</td></tr>
<tr><td>CISPR 11
RF Emissions</td><td>Class A</td><td rowspan="3">The pump is suitable for use in all establishments, other than domestic, and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.</td></tr>
<tr><td>EN 61000-3-2
Harmonic Emissions</td><td>Class A</td></tr>
<tr><td>EN 61000-3-3
Voltage Fluctuations, Flicker Emissions</td><td>Complies</td></tr>
</table>

Electromagnetic Compatibility *(continued)*

Guidance and Manufacturer's Declaration - Electromagnetic Immunity			
The Alaris® Syringe Pump is intended for use in the electromagnetic environment specified below. The customer or the user of Alaris® Syringe Pump should assure that it is used in such an environment.			
Immunity Test	**EN 60601-1-2 Test Level**	**Compliance Level**	**Electromagnetic Environment – Guidance**
EN 61000-4-2 Electro-Static Discharge (ESD)	±6 kV contact ±8 kV air	±8 kV contact (Note 2) ±15 kV air (Note 2)	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %.
EN 61000-4-4 Electrical Fast Transient, Burst (EFT) (Note 3)	±2 kV for power supply lines ±1 kV for input/ output lines	±2 kV for power supply lines N/A (Note 4)	Mains power quality should be that of a typical commercial or hospital environment.
EN 61000-4-5 Power Line Surge (Note 3)	±1 kV Line(s) to Line(s) ±2 kV Line(s) to Earth	±1 kV Line(s) to Line(s) ±2 kV Line(s) to Earth	Mains power quality should be that of a typical commercial or hospital environment.
EN 61000-4-8 Power Frequency Magnetic Field (50/60 Hz)	3 A/m	400 A/m 50 Hz (Note 2)	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
EN 61000-4-11 Voltage Dips, Short Interruptions, and Voltage Variations (Note 3)	<5 % UT (Note 1) (>95 % dip in UT) for 0.5 cycle	<5 % UT (>95 % dip in UT) for 0.5 cycle	Mains power quality should be that of a typical commercial or hospital environment. If the user of the pump requires continued operation during power mains interruptions, it is recommended that the pump be powered from an uninterruptible power supply or a battery. The pump does employ an internal short duration battery.
	40 % UT (60 % dip in UT) for 5 cycles	40 % UT (60 % dip in UT) for 5 cycles	
	70 % UT (30 % dip in UT) for 25 cycles	70 % UT (30 % dip in UT) for 25 cycles	
	<5 % UT (>95 % dip in UT) for 5 sec	<5 % UT (>95 % dip in UT) for 5 sec	

Note 1—U_T is the AC mains voltage prior to application of the test level.
Note 2—Compliance levels raised by EN 60601-2-24.
Note 3—Performed at the Minimum and Maximum Rated Input Voltage.
Note 4—Cardinal Health recommends using signal cables of less than 3 meters in length and this requirement is applicable only if signal cables are 3 meters or more in length. (EN 60601-1-2:2002, Clause 36.202.4)

Electromagnetic Compatibility *(continued)*

Guidance and Manufacturer's Declaration—Electromagnetic Immunity
LIFE SUPPORT Equipment

The Alaris® Syringe Pump is intended for use in the electromagnetic environment specified below.
The customer or the user of the Alaris® Syringe Pump should ensure that it is used in such an environment.

Immunity Test	EN 60601-1-2 Test Level	Compliance Level	Electromagnetic Environment – Guidance
EN 61000-4-6 Conducted RF	3 V rms 150 kHz to 80 MHz	10 V rms (Note 3)	Portable and mobile RF communications equipment should be used no closer to any part of the pump, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended Separation Distance** $d = \left[\frac{3.5}{V_1}\right]\sqrt{P}$
EN 61000-4-3 Radiated RF	3 V/m 80 MHz to 2.5 GHz	10 V/m (Note 3)	$d = \left[\frac{12}{V_2}\right]\sqrt{P}$ 80 MHz to 800 MHz $d = \left[\frac{12}{E_1}\right]\sqrt{P}$ 80 MHz to 2.5 GHz $d = \left[\frac{23}{E_1}\right]\sqrt{P}$ 800 MHz to 2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m).a Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, b should be less than the compliance level in each frequency range. c Interference may occur in the vicinity of equipment marked with the following symbol:

Note 1—At 80 MHz and 800 MHz, the higher frequency range applies.

Note 2—These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

Note 3—Compliance levels raised by EN 60601-2-24.

a The compliance levels in the ISM frequency bands between 150 kHz and 80 MHz and in the frequency range 80 MHz to 2.5 GHz are intended to decrease the likelihood that mobile/portable communications equipment could cause interference if it is inadvertently brought into patient areas. For this reason, an additional factor of 10/3 is used in calculating the recommended separation distance for transmitters in these frequency ranges.

b Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast, and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the pump is used exceeds the applicable RF compliance level above, the pump should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the pump.

c Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 10 V/m.

Electromagnetic Compatibility *(continued)*

Recommended Separation Distances for LIFE SUPPORT Equipment between

portable and mobile RF communications equipment and the Alaris® Syringe Pump

The Alaris® Syringe Pump is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled.

The user of the Alaris® Syringe Pump can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Alaris® Syringe Pump as recommended below, according to the maximum output power of the communications equipment.

Rated Maximum Output Power of Transmitter W	**Separation Distance According to Frequency of Transmitter** m			
	150 kHz to 80 MHz Outside ISM bands 3.5 $d = [\text{------}] \sqrt{P}$ V_1	**150 kHz to 80 MHz In ISM bands** 12 $d = [\text{------}] \sqrt{P}$ V_2	**80 MHz to 800 MHz** 12 $d = [\text{------}] \sqrt{P}$ E_1	**800 MHz to 2.5 GHz** 23 $d = [\text{------}] \sqrt{P}$ E_1
0.01	0.03	0.12	0.12	0.23
0.1	0.11	0.38	0.38	0.73
1	0.35	1.20	1.20	2.30
10	1.11	3.80	3.80	7.28
100	3.50	12.00	12.00	23.00

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be determined using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

Note 1—At 80 MHz and 800 MHz, the separation distance for the higher frequency range apply.
Note 2—The ISM (Industrial, Scientific, and Medical) bands between 150 kHz and 80 MHz are 6.765 MHz to 6.795 MHz; 13.553 MHz to 13.567 MHz; 26.957 MHz to 27.283 MHz; and 40.66 MHz to 40.70 MHz.
Note 3—An additional factor of 10/3 is used in calculating the recommended separation distance for transmitters in the ISM frequency bands between 150 kHz and 80 MHz and in the frequency range 80 MHz to 2.5 GHz to decrease the likelihood that mobile/portable communications equipment could cause interference if it is inadvertently brought into patient areas.
Note 4—These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

Appendix B

Disposal

In this appendix

Disposal	**70**
Battery Removal	**70**

Disposal

Information on Disposal for Users of Waste Electrical & Electronic Equipment

This ⌧ symbol on the product and/or accompanying documents means that used electrical and electronic products should not be mixed with municipal waste.

If you wish to discard electrical and electronic equipment, please contact your Cardinal Health affiliate office or distributor for further information.

Disposing of this product correctly will help to save valuable resources and prevent any potential negative effects on human health and the environment which could otherwise arise from inappropriate waste handling.

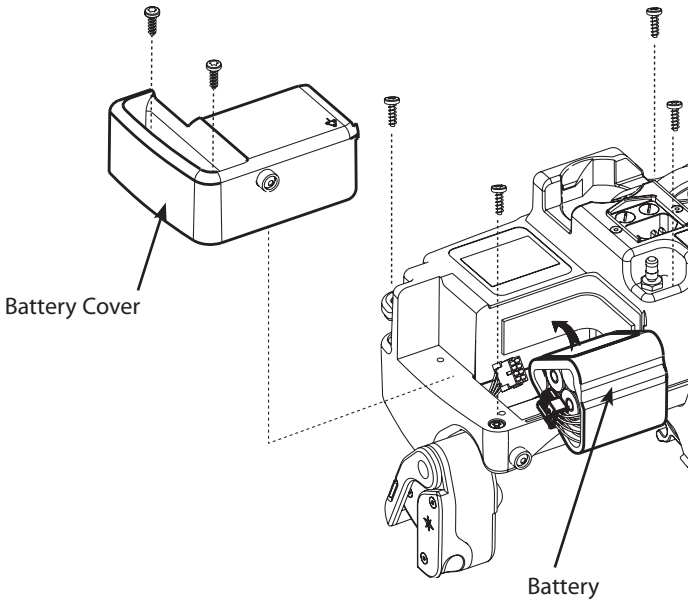
Information on Disposal in Countries outside the European Union

This symbol is only valid in the European Union. The product should be disposed of taking environmental factors into consideration. To ensure no risk or hazard, remove the internal rechargeable battery and the Nickel Metal Hydride battery from the control board and dispose of as outlined by the local country regulations. All other components can be safely disposed of as per local regulations.

Battery Removal

Remove the Main Battery

Remove the two case screws in battery cover, remove cover and battery.



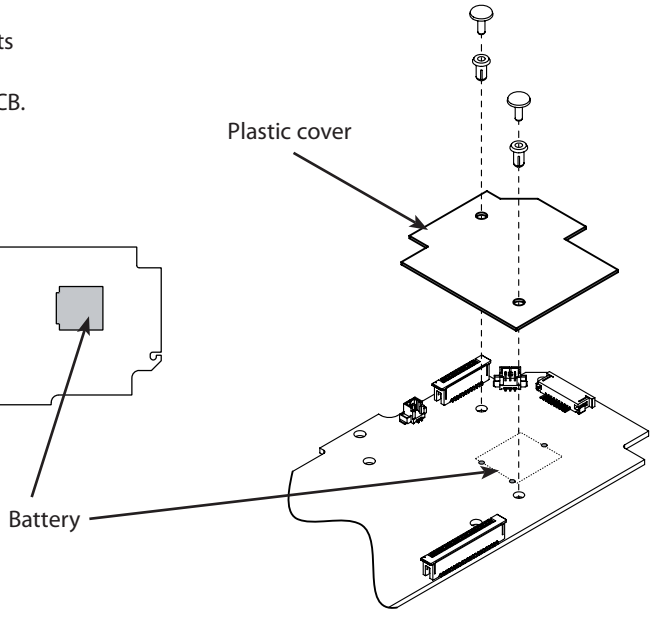
Remove the Battery on Control PCB

Remove the Control PCB from the pump, see 'Spare Parts Replacement Procedures'.

Remove the protective plastic cover from the Control PCB.

Desolder battery from the Control PCB.

Control PCB Reverse side



Appendix C

Spare Parts Listing

In this appendix

Electrical parts listing	**72**
Front case parts listing	**72**
Rear case parts listing	**73**
Keypads and labels	**73**
Transmission parts listing	**74**
Software	**74**
Test equipment	**75**

Electrical Parts Listing

Part Number	DESCRIPTION
1000EL00222	FUSE, T-1.25A SLOW BLOW, MAINS
1000SP00189	ASENA SP, KIT, CHASSIS PCB
1000SP01273	Asena TIVA, Control PCB, Mk3
1000SP01118	ASENA GS, DISPLAY PCB
1000SP01119	ASENA GH/CC/TIVA, DISPLAY PCB
1000SP01272	Asena GH, Control PCB, Mk3
1000SP01122	ASENA SP, ASSY, BATTERY
1000SP01124	ASENA SP, KIT, MAINS INLET
1000SP01125	ASENA SP, ASSY, SYRINGE SIZE POTENTIOMETER
1000SP01130	ASENA SP, KIT, SPEAKER
1000SP01275	Asena GS, Control PCB, Mk3
1000SP01155	ASENA CC, KIT, PRESSURE TRANSDUCER
1000SP01160	ASENA SP, KIT, RS232 (PCB & FIXINGS)
1000SP01271	Asena CC, Control PCB, Mk3
8000EL00019	ASENA SP, PLUNGER DETECT PCB
8000EL00022	ASENA SP, CARRIAGE PCB
1000SP01218	Asena PK, Control PCB, Mk3
8000EL00063	ASENA SP, ASSY, POWER SUPPLY UNIT (PSU)

Front Case Parts Listing

Part Number	DESCRIPTION
1000SP01153	ASENA CC, KIT, FRONT CASE
1000SP00478	ASENA GS, KIT, FRONT CASE
1000SP00479	ASENA GH, KIT, FRONT CASE
1000SP00480	ASENA TIVA , KIT, FRONT CASE
1000SP01204	ASENA PK , KIT, FRONT CASE
1000SP00593	ASENA SP, KIT, SPARE ADHESIVE FOOT RIVET REPLACEMENT
1000SP00595	ASENA SP, KIT, SPARE ADHESIVE FOOT
1000SP01137	ASENA GH/CC/TIVA, KIT, DISPLAY PROTECTION
1000SP01123	ASENA SP, KIT, SYRINGE & FLANGE CLAMPS
1000SP01116	ASENA SP, KIT, SYRINGE SIZER
1000ME01500	Adaptor GS Display MkII Asena
1000SP00187	ASENA GS, ASSY, DISPLAY INSULATOR
1000SP00188	ASENA GH/CC/TIVA, ASSY, DISPLAY INSULATOR
0000ME00423	PAD SELF ADHESIVE DOUBLE SIDED 12X12MM
1000ME00261	ASENA SP, ASSY, BRACKET DISPLAY MOUNTING
1000ME01301	ASENA SP, ASSY, GASKET DISPLAY
1000ME00450	ASENA CC, ASSY, TOP DISC HOLDER
1000ME00311	ASENA SP, CASE SEALING CORD (1M)
1000SP01326	Alaris SP CC Disc Detect parts Kit
1000SP00466	ASENA SP, KIT, FIXINGS (SCREWS,WASHERS,ETC)
1000SP00170	ASENA SP, Kit, CAM Kit
1000SP00570	ASENA SP, Kit, Syringe Flange Clamps (2 piece)
1000SP00577	ASENA SP, Kit, Syringe Flange Clamps (1 piece)
1000SP00273	ASENA GS, Kit, Backlight Shield
1000SP01144	ASENA Kit Grease LMX

Rear Case Parts Listing

Part Number	DESCRIPTION
1000SP01115	Alaris GS/GH/TIVA/PK, KIT, REAR CASE
1000SP01154	ASENA CC, KIT, REAR CASE
1000SP01121	ASENA SP, BATTERY COVER/HANDLE
1000SP00593	ASENA SP, KIT, SPARE ADHESIVE FOOT RIVET REPLACEMENT
1000SP00595	ASENA SP, KIT, SPARE ADHESIVE FOOT
1000SP01114	ASENA SP, KIT, RAIL CAM
1000SP00115	ASENA SP, ASSY, POLE CLAMP
1000ME01213	ASENA SP, TUBE RESTRAINT BLANK
1000ME01214	ASENA SP, TUBE RESTRAINT RS232
1000ME01303	MAGNET IR DETECT
1000ME01306	ASENA SP, ASSY, PSU INSULATOR
1000ME01317	ASENA CC, ASSY, PLUG BLANKING TRANSDUCER
1000SP00466	ASENA SP, KIT, FIXINGS (SCREWS,WASHERS,ETC)
1000SP00467	ASENA SP/GW, KIT, PE STUD
1000SP00468	ASENA SP/GW, KIT, RS232 CONNECTOR
1000SP01323	Alaris SP Cam Rail Clamp only Kit
1000SP01324	Alaris SP Cam Rail Release Lever only Kit
1000SP01325	Alaris SP Main Case Screws 80 off
1000SP00589	SPARE KIT POLE CLAMP ARM

Keypads and Labels

Part Number	DESCRIPTION
1000SP01126	ASENA GH/CC, KEY, SWITCH OVERLAY KEYPAD
1000SP01127	ASENA GS, KEY, SWITCH OVERLAY KEYPAD
1000SP00403	ASENA TIVA, KEY, SWITCH OVERLAY KEYPAD
1000SP01203	ASENA PK, KEY, SWITCH OVERLAY KEYPAD
1000LB00625	Keypad Asena SP On/Off
1000LB01405	Asena PK Keypad - On/Off BOM
1000LB00626	Keypad Asena GH Shelf
1000LB01404	Asena PK Keypad - Shelf- BOM
1000LB00628	Keypad Asena GS Shelf
1000LB00627	Keypad Asena GH Options
1000LB01403	Asena PK Keypad - Options - BOM
1000LB00629	Keypad Asena GS Options
1000LB00630	Keypad Asena TIVA Options
1000LB00431	ASENA SP, LBL, LABEL CHASSIS SCREW COVER
1000LB01408	LABEL SET CC SYRINGE PUMP
1000LB01409	LABEL SET GH SYRINGE PUMP
1000LB01410	LABEL SET GS SYRINGE PUMP
1000LB01411	LABEL SET TIVA SYRINGE PUMP
1000LB01414	LABEL SET PK SYRINGE PUMP
1000LB00293	Label Set Asena Syringe Pumps Low-Tac
1000LB00590	Instrument Label 1″x1 1/2″

Transmission Parts Listings

Part Number	DESCRIPTION
1000ME01218	ASENA SP, GRIPPER BOTTOM
1000ME01219	ASENA SP, GRIPPER TOP
1000SP00230	ASENA SP, KIT, CARRIAGE BUFFER
1000SP01109	ASENA SP, KIT, STEPPER MOTOR
1000SP01111	Spare Bearing Block Asena (P8)
1000SP01112	ASENA SP, KIT, CHASSIS ASSEMBLY
1000SP01113	ASENA SP, KIT, PLUNGER ASSEMBLY
1000SP01136	ASENA SP, KIT, CHASSIS ENHANCEMENT (MkI & MkII)
1000SP01328	ASENA SP, KIT, CHASSIS ENHANCEMENT MkIII Kit
1000SP01110	ASENA SP, KIT, MOTOR PLATE
1000SP01107	SPARE CARRAIGE ASENA
1000ME01198	GEAR DECLUTCH
1000SP00408	SP KIT MOTOR PLATE STRAIN BEAM SUPPORT
1000SP01320	Alaris SP Plunger Fixings Kit
1000SP01321	Alaris SP Plunger Back Plate Kit
1000SP01322	Alaris SP Intermediate Tube Kit
1000SP01327	Alaris SP Leadscrew Kit

Software

Part Number	DESCRIPTION
1000SP01221	Asena Mk1&2 V1.5.10 & V1.6.2 Sprs Kit
1000SP01270	ASENA SYRINGE PUMP, SOFT, SOFTWARE CD V1.9.4 (MK1 & 2)
1000SP01227	ASENA CC, SOFT, SOFTWARE CD V2.0.0 (MK3)
1000SP01225	ASENA GS, SOFT, SOFTWARE CD V2.0.0 (MK3)
1000SP01226	ASENA GH, SOFT, SOFTWARE CD V2.0.0 (MK3)
1000SP01228	ASENA TIVA, SOFT, SOFTWARE CD V2.1.0 (MK3)
1000SP01267	ASENA CC, SOFT, SOFTWARE CD V2.3.6 (MK3)
1000SP01276	ASENA GS, SOFT, SOFTWARE CD V2.3.6 (MK3)
1000SP01268	ASENA GH, SOFT, SOFTWARE CD V2.3.6 (MK3)
1000SP01269	ASENA TIVA, SOFT, SOFTWARE CD V2.3.6 (MK3)
1000SP01289	Asena PK Spares Kit V3.2.12 (SMUv3)
1000CD00028	Alaris® Software Maintenance Utility CD

Test Equipment

Part Number	DESCRIPTION
1000SP00373	Alaris Calibration Kit Includes:

1000TG00080	Linear Speed Test Gear BOM	0000TG00033	Test Gear Stopwatch
0000JG00175	Syringe Sizing Shim	1000TG00095	Linear Sizing Spacer BOM
1000TG00010	Syringe Sizing Spacer BOM	1000TG00055	Syringe Sizing Spacer BOM
1000TG00011	Syringe Sizing Spacer	1000TG00059	Linear Sizing Spacer BOM
0000JG00014	Asena SP & P Series,test,plunger Protect	5000SP00010	Spare Key Elec/mech P5000
0000TG00200	Digital Occlusion Test Gear (Cal)	0000TG00032	Test Gear Magnet PCAM

0000JG00047	ASENA SP, TEST, CASE CRADLE JIG
0000JG00053	ASENA SP, TEST, PE STUD SOCKET
1000SP00172	ASENA SP, KIT, IRDA PORT CABLE & HEADER PCB
1000SP00209	ASENA SP, KIT, EVENT LOG DOWNLOAD UTILITY
1000SP00336	Alaris SP/GW, ASSY, RS232 CABLE
1000SP00481	ASENA SP, TEST, SYRINGE CLAMP JIG
1000ME01466	POLE CLAMP SNAKE EYE DRIVER
G30402M	EXT SET, 200cm, P-DISC

Appendix D

Fitting & Replacement Guidelines

In this appendix

General assembly information **77**

Torque guide **77**

General assembly information

1. A wide range of self-tapping fasteners are available.
2. PT screws are for plastic, self-tapping applications.
3. TAPTITE screws are for metal self thread-forming applications. These can be recognised by a triangular cross-section on the end.
4. Almost all fasteners on the Alaris® Syringe Pumps are self-tapping and have the potential to be over-tightened (over-torqued).
5. The force required to create a thread for the first time is more than when reassembling a previously made joint.
6. Always use the correct torque level when first making an assembly stage.
7. Take care with the torque applied when re-assembling parts. Less torque is required, so a hand tool may be more appropriate.
8. In many situations a stripped thread will require replacement of the failed component.
9. The head patterns of the fasteners are of the following types:
   - Pozi Number 1 (smaller X head)
   - Pozi Number 2 (larger X head)
   - Torx Number T8 (Small star profile, used typically on countersunk parts with smaller heads - Backplate / Mains Inlet / Carriage PCB screw).
   - Torx Number T10 (Medium star profile, used on the majority of Alaris® Syringe Pump Torx fasteners)
   - Torx Number T20 (Larger star shape, typically for case securing screws)
   - M3 (Hex head with 5.5mm across flats (AF) drivers)
   - M4 nuts (Hex head with 7mm across flats (AF) drivers)
10. Always select the correct tool and bit pattern for the fastener.

Torque guide

1. When selecting a torque for a servicing activity, be aware that refastening will require less torque than the initial manufacture.
2. Use this information as a guide to the 'do not exceed' torque levels when servicing the equipment. When servicing it is recommended that torque is applied gradually until the component is secure. In any process do not exceed the stated levels.
3. If a torque driver is available for servicing this will help control the applied torque. Otherwise, be aware that excess force may cause the component to fail.

Plunger Drive Assembly:

Stage Description	Component Description	Qty	Established Process Torque
Intermediate Tube Bearing Plate	Screw - PT K30x8 Pan Hd Torx (T10)	2	50 cNm
Fixing Gripper Gears	Screw - PT K22x12 Pan Hd (T6)	2	50 cNm
Screw on the Backplate Assembly	Screw - PT K30x12 Csk Torx (T8) Rogard	3	40 cNm

Main Chassis Assembly:

Stage Description	Component Description	Qty	Established Process Torque
Mount motor onto motor plate	Screw - M3x12 Pan Hd Torx (T10)	3	60 cNm
Mount motor plate to chassis assembly	Screw - Taptite M4x10 Csk Pozi	3	1.0 Nm
Attach drive belt and leadscrew pulley	Nut - M4 Full	1	40 cNm
Secure Carriage PCB to carriage	Screw - PT K30x6 Csk Pozi	1	30 cNm
Secure carriage plate to carriage	Screw - PT K30x6 Pan Hd Torx (T10)	1	40 cNm
Secure bearing block to chassis	Screw - Taptite M4x10 Csk Pozi	3	1.0 Nm

Torque guide *(continued)*

Front Case Assembly:

Stage Description	Component Description	Qty	Established Process Torque
Secure syringe sizing retainer	Screw - PT K30x8 Csk Pozi	2	40 cNm
Attach syringe clamp	Screw M3 x 8 Pan Hd Torx (T10)	1	50 cNm
Secure display / mounting brackets to front case	Screw PT K30x12 Csk Pozi	4	50 cNm
Secure syringe flange clamp to chassis / bearing block	Screw - PT K30x14 Pan Hd Torx (T10)	2	70 cNm
Secure chassis to front case	Screw M3x8 Taptite Csk Pozi	1	50 cNm
Secure plunger drive to carriage	Screw - PT K30x6 Pan Hd Torx (T10)	2	30 cNm
Secure RS232 option	Spacer 8mm Hex Br/Ni Pl M3x6mm	4	hand tight
	Nut M3 St. St A2	4	40 cNm
	Screw M3x6 Pan Hd Pozi Z+C	4	40 cNm
Secure Control board	Screw - PT K30x6 Pan Hd Torx (T10)	3	30 cNm
Secure Chassis PCB to chassis	Screw - M3x8 Taptite Pan Hd	2	50 cNm
Secure Model CC pressure transducer assembly to front case	Screw - PT K30x12 Pan Hd Torx (T10)	2	70 cNm

Assembly Rear Case:

Stage Description	Component Description	Qty	Established Process Torque
Attach pole clamp to rear case	Screw - M3x8 Pan Hd Torx (T10)	3	70 cNm
Attach pole clamp arm to pole v clamp	Pivot screw	1	2 Nm
Secure rail clamp to cam	Screw - PT K30x10 Csk Torx (T8) Rogard	1	70 cNm
Attach camera lever	Screw PT K30x8 Pan Hd Torx (T10)	1	60 cNm
Secure mains inlet assy to retainer	Screw - PT K30x12 Csk Torx (T8) Rogard	2	40 cNm
Secure PE stud	M6 Nut	2	hand tight
Secure PSU to case	Screw - PT K30x8 Pan Hd Torx (T10)	3	40 cNm
Secure earth lead to PSU metal frame	Screw M3x6 Pan Hd Pozi	1	hand tight
Fit tube restraint / RS232 cover	Screw PT K30x8 Csk	2	40 cNm
Fit RS232 male / female connectors	Jack Socket RS232 P8000	1	hand tight
Secure Model CC pressure transducer assembly to rear case	Screw - 4gx1/2" S/T B Zn Clr Pz1	1	60 cNm

Final Assembly:

Stage Description	Component Description	Qty	Established Process Torque
Secure front case to rear case	Screw PT K40x12 Pan Hd Torx (T20)	6	70 cNm
Secure battery cover / handle	Screw PT K40x12 Pan Hd Torx (T20)	2	70 cNm

Pressure Transducer Assembly for Model CC only:

Stage Description	Component Description	Qty	Established Process Torque
Secure disk holder centre to top	Screw PT K30x8 Pan Hd Torx (T10)	1	50 cNm
Secure disk holder base to centre	Screw PT K30x8 Pan Hd Torx (T10)	4	50 cNm

Appendix E

Configuration & Drug Protocol Records

In this appendix

Alaris® GS Syringe Pump Configured Options Record	**80**
Alaris® GH Syringe Pump Configured Options Record	**81**
Alaris® CC Syringe Pump Configured Options Record	**82**
Alaris® TIVA Syringe Pump Configured Options Record	**83**
Alaris® CC Syringe Pump Drug Protocol Setup	**84**
Alaris® TIVA Syringe Pump Drug Protocol Setup	**85**

Alaris® GS Syringe Pump Configured Options Record

General Options

Enter the pump-specific information for your records on a copy of this page.

Option	Default		Range	Setting
Software Version	**1.5.10 & 2.0.0**	**1.9.x 2.3.x and above**		
NURSE CALL FITTED	Disabled	Disabled	Enabled/Disabled	
NURSE CALL INVERT	Disabled	Disabled	Enabled/Disabled	
RS232 SELECTED	Disabled	Disabled	Enabled/Disabled	
NEOI WARNING	1min	5mins	1min - 15mins	
EOI POINT	1.0%	1.0%	0.1% - 5% of syringe volume	
KVO AT EOI	Enabled	Enabled	Enabled/Disabled	
KVO RATE	1.0ml/h	1.0ml/h	0.1ml/h - 2.5ml/h	
BACK OFF		Enabled	Enabled/Disabled	
AUTO SAVE	Enabled	Enabled	Enabled/Disabled	
RATE LOCK	Disabled	Disabled	Enabled/Disabled	
QUIET MODE	Disabled	Disabled	Enabled/Disabled	
AC FAIL	Enabled	Enabled	Enabled/Disabled	
PRESSURE DISPLAY	Disabled	Enabled	Enabled/Disabled	
PRESSURE DEFAULT	L3	L3	L0 - L10(50mmHg -1000mmHg)	
CAP RATE	Max infusion rate	200ml/h	1.0ml/h - 200ml/h	
PURGE RATE	200ml/h	200ml/h	100ml/h - 500ml/h	
PURGE VOLUME LIMIT	2.0ml	2.0ml	0.5ml - 5.0ml	
PURGE SYRINGE		Disabled	Enabled/Disabled	
BOLUS	Enabled	Enabled	Enabled/Disabled	
DEFAULT BOLUS	Max bolus rate	500ml/h	10ml/h - 500ml/h	
CAP BOLUS RATE	Max bolus rate	500ml/h	10ml/h - 500ml/h	
BOLUS VOL LIMIT	5.0ml	5.0ml	0.5ml (0.1ml)* - 25.0ml	
MANUAL BOLUS		Disabled	Enabled/Disabled	
CALL BACK TIME		2.0mins	0.1mins - 15mins	
EVENT LOG DISPLAY	Disabled	Enabled	Enabled/Disabled	
BATTERY ICON		Enabled	Enabled/Disabled	
AUDIO VOLUME	Medium	Medium	Low, Medium, High	
AUTO NIGHT MODE	Enabled	Enabled	Enabled/Disabled	

Syringes Enabled

* For software versions 1.9.x & 2.3.x and above

Make	Size(s)	Make	Size(s)

Hospital Name ***Serial No.*** ***Software Version***

Approved by ***Configured by***

Date ***Date***

Alaris® GH Syringe Pump Configured Options Record

General Options

Enter the pump-specific information for your records on a copy of this page.

Option	Default		Range	Setting
Software Version	1.5.10 & 2.0.0	1.9.x 2.3.x and above		
NURSE CALL FITTED	Disabled	Disabled	Enabled/Disabled	
NURSE CALL INVERT	Disabled	Disabled	Enabled/Disabled	
RS232 SELECTED	Disabled	Disabled	Enabled/Disabled	
NEOI WARNING	1min	5mins	1min - 15mins	
EOI POINT	1.0%	1.0%	0.1% - 5% of syringe volume	
KVO AT EOI	Enabled	Enabled	Enabled/Disabled	
KVO RATE	1.0ml/h	1.0ml/h	0.1ml/h - 2.5ml/h	
BACK OFF	Disabled	Enabled	Enabled/Disabled	
AUTO SAVE	Enabled	Enabled	Enabled/Disabled	
RATE LOCK	Disabled	Disabled	Enabled/Disabled	
QUIET MODE	Disabled	Disabled	Enabled/Disabled	
AC FAIL	Enabled	Enabled	Enabled/Disabled	
RATE TITRATION	Disabled	Disabled	Enabled/Disabled	
PRESSURE DISPLAY	Disabled	Enabled	Enabled/Disabled	
CAP PRESSURE		L10	L0 - L10(50mmHg -1000mmHg)	
PRESSURE DEFAULT	L3	L3	L0 - L10(50mmHg -1000mmHg)	
CAP RATE	Max infusion rate	1200ml/h	1.0ml/h - 1200ml/h	
PURGE RATE	200ml/h	200ml/h	100ml/h - 500ml/h	
PURGE VOLUME LIMIT	2.0ml	2.0ml	0.5ml - 5.0ml	
PURGE SYRINGE		Disabled	Enabled/Disabled	
BOLUS	Enabled	Enabled	Enabled/Disabled	
DEFAULT BOLUS	Max bolus rate	500ml/h	10ml/h - 1200ml/h	
CAP BOLUS RATE	Max bolus rate	1200ml/h	10ml/h - 1200ml/h	
BOLUS VOL LIMIT	5.0ml	5.0ml	0.5ml (0.1ml)* - 25.0ml	
MANUAL BOLUS		Disabled	Enabled/Disabled	
CALL BACK TIME		2mins	0.1mins - 15mins	
VTBI CLEAR RATE		Disabled	Enabled/Disabled	
EVENT LOG DISPLAY	Disabled	Enabled	Enabled/Disabled	
BATTERY ICON		Enabled	Enabled/Disabled	
AUDIO VOLUME	Medium	Medium	Low, Medium, High	
AUTO NIGHT MODE	Enabled	Enabled	Enabled/Disabled	

Syringes Enabled

Make	Size(s)

Drug Names

* For software versions 1.9.x & 2.3.x and above

1		7	
2		8	
3		9	
4		10	
5		11	
6		12	

Hospital Name ***Serial No.*** ***Software Version***

Approved by ***Configured by***

Date ***Date***

Alaris® CC Syringe Pump Configured Options Record

General Options

Enter the pump-specific information for your records on a copy of this page.

Option	Default		Range	Setting
Software Version	**1.5.10 & 2.0.0**	**1.9.x 2.3.x and above**		
NURSE CALL FITTED	Disabled	Disabled	Enabled/Disabled	
NURSE CALL INVERT	Disabled	Disabled	Enabled/Disabled	
RS232 SELECTED	Disabled	Disabled	Enabled/Disabled	
NEOI WARNING	1min	5mins	1min - 15mins	
EOI POINT	1.0%	1.0%	0.1% - 5% of syringe volume	
KVO AT EOI	Enabled	Enabled	Enabled/Disabled	
KVO RATE	1.0ml/h	1.0ml/h	0.1ml/h - 2.5ml/h	
BACK OFF	Disabled	Enabled	Enabled/Disabled	
AUTO SAVE	Enabled	Enabled	Enabled/Disabled	
RATE LOCK	Disabled	Disabled	Enabled/Disabled	
QUIET MODE	Disabled	Disabled	Enabled/Disabled	
AC FAIL	Enabled	Enabled	Enabled/Disabled	
RATE TITRATION	Disabled	Disabled	Enabled/Disabled	
PRESSURE DISPLAY	Disabled	Enabled	Enabled/Disabled	
AUTO PRESSURE	Disabled	Enabled	Enabled/Disabled	
AUTO SET PRESSURE		Disabled	Enabled/Disabled	
AUTO OFFSET		30mmHg	15mmHg - 100mmHg	
PRESSURE DEFAULT	300mmHg	300mmHg	1mmHg - 1000mmHg	
MAX PRESSURE	1000mmHg	1000mmHg	1mmHg - 1000mmHg	
WEIGHT	70Kg	1.00Kg	0.01Kg - 250Kg	
CAP RATE	Max infusion rate	1200ml/h	1.0ml/h - 1200ml/h	
PURGE RATE	200ml/h	200ml/h	100ml/h - 500ml/h	
PURGE VOLUME LIMIT	2.0ml	2.0ml	0.5ml - 5.0ml	
PURGE SYRINGE		Disabled	Enabled/Disabled	
BOLUS	Enabled	Enabled	Enabled/Disabled	
DEFAULT BOLUS	Max bolus rate	500ml/h	10ml/h - 1200ml/h	
CAP BOLUS RATE	Max bolus rate	1200ml/h	10ml/h - 1200ml/h	
BOLUS VOL LIMIT	5.0ml	5.0ml	0.5ml (0.1ml)* - 25.0ml	
MANUAL BOLUS		Disabled	Enabled/Disabled	
CALL BACK TIME		2.0mins	0.1mins - 15mins	
VTBI CLEAR RATE		Disabled	Enabled/Disabled	
EVENT LOG DISPLAY	Disabled	Enabled	Enabled/Disabled	
BATTERY ICON		Enabled	Enabled/Disabled	
AUDIO VOLUME	Medium	Medium	Low, medium, high	
AUTO NIGHT MODE	Enabled	Enabled	Enabled/Disabled	

Units Enabled

* For software versions 1.9.x & 2.3.x and above

☐ ng/min	☐ µg/kg/min	☐ µg/24h	☐ mg/kg/min	☐ mg/24h	☐ g/24h	☐ U/h	☐ U/kg/24h
☐ ng/kg/min	☐ µg/h	☐ µg/kg/24h	☐ mg/h	☐ mg/kg/24h	☐ U/min	☐ U/kg/h	☐ kU/24h
☐ µg/min	☐ µg/kg/h	☐ mg/min	☐ mg/kg/h	☐ g/h	☐ U/kg/min	☐ U/24h	☐ mmol/h

Syringes Enabled

Make	Size(s)	Make	Size(s)

Hospital Name **Serial No.** **Software Version**

Approved by **Configured by**

Date **Date**

Alaris® TIVA Syringe Pump Configured Options Record

General Options

Enter the pump-specific information for your records on a copy of this page.

Option	Default		Range	Setting
Software Version	**1.6.2 & 2.1.0**	**1.9.x 2.3.x and above**		
NURSE CALL FITTED	Disabled	Disabled	Enabled/Disabled	
NURSE CALL INVERT	Disabled	Disabled	Enabled/Disabled	
RS232 SELECTED	Disabled	Disabled	Enabled/Disabled	
NEOI WARNING	1min	5mins	1min - 15mins	
EOI POINT	1.0%	1.0%	0.1% - 5% of syringe volume	
KVO AT EOI	Enabled	Enabled	Enabled/Disabled	
KVO RATE	1.0ml/h	1.0ml/h	0.1ml/h - 2.5ml/h	
BACK OFF	Disabled	Enabled	Enabled/Disabled	
AC FAIL	Enabled	Enabled	Enabled/Disabled	
PRESSURE DISPLAY	Disabled	Enabled	Enabled/Disabled	
PRESSURE DEFAULT	L-5	L-3	L0 - 10(50mmHg -1000mmHg)	
WEIGHT	70.0Kg	70.0Kg	0.01Kg - 250Kg	
PURGE RATE	200ml/h	200ml/h	100ml/h - 500ml/h	
PURGE VOLUME LIMIT	2.0ml	2.0ml	0.5ml - 5.0ml	
PURGE SYRINGE	Enabled	Disabled	Enabled/Disabled	
HANDS FREE BOLUS	Enabled	Enabled	Enabled/Disabled	
DEFAULT BOLUS VOL	5.0ml	5.0ml	0.1ml - 100ml	
DEFAULT BOLUS RATE	1200ml/h	1200ml/h	150ml/h - 1200ml/h	
MANUAL BOLUS		Disabled	Enabled/Disabled	
CALLBACK TIME		2.0mins	0.1mins - 15.0mins	
EVENT LOG DISPLAY	Disabled	Enabled	Enabled/Disabled	
BATTERY ICON		Enabled	Enabled/Disabled	
AUDIO VOLUME	Medium	Medium	Low, Medium, High	
AUTO NIGHT MODE	Enabled	Enabled	Enabled/Disabled	

Syringes Enabled

Make	Size(s)	Make	Size(s)

Hospital Name ***Serial No.*** ***Software Version***

Approved by ***Configured by***

Date ***Date***

Alaris® CC Syringe Pump Drug Protocol Setup

Hospital _____ *Ward/Unit* _____

No. (1-50*)	Drug Name (12 Chars max*)	Dose Rate				Concentration				Bolus		Pressure Alarm
		Dose Units	Max	Default	Min	Units	Min	Default	Max	Max (ml)	Rate (ml/h)	

Serial Number _____ *Software Version* _____

Approved by _____ *Configured by* _____

Date _____ *Date* _____

* - 100 drug names with a maximum of 17 characters are available for V2.3.x & above software.

1000SM00001 Issue 10

Alaris® TIVA Syringe Pump Drug Protocol Setup

Hospital _____ ***Ward/Unit*** _____

No. (1-50*)	Drug Name (12 Chars max*)	Concentration				Dose Rate Units	Induction (dose) (–/Kg)	Time (sec)	Pause after Induction (✓/×)	Maintenance	Bolus		
		Units (–/ml)	Min	Default	Max						Dose (–/Kg)	Rate (ml/h)	Hands Free (✓/×)

Serial Number _____ ***Software Version*** _____

Approved by _____ ***Configured by*** _____

Date _____ ***Date*** _____

* - 100 drug names with a maximum of 17 characters are available for V2.3.x & abovesoftware.

Appendix F

Service Contacts

Service Contacts

For service, contact your local Cardinal Health Affiliate Office or Distributor.

AE

Cardinal Health,
PO Box 5527,
Dubai, United Arab Emirates.
Tel: (971) 4 28 22 842
Fax: (971) 4 28 22 914

AU

Cardinal Health,
8/167 Prospect Highway,
Seven Hills, NSW 2147,
Australia.
Tel: (61) 2 9838 0255
Fax: (61) 2 9674 4444
Fax: (61) 2 9624 9030

BE

Cardinal Health,
Otto De Mentockplein 19,
1853 Strombeek - Bever,
Belgium.
Tel: (32) 2 267 38 99
Fax: (32) 2 267 99 21

CA

Cardinal Health,
235 Shields Court,
Markham,
Ontario L3R 8V2,
Canada.
Tel: (1) 905-752-3333
Tel: 800-908-9918
Fax: (1) 905-752-3343

CN

Cardinal Health,
Shanghai Representative Office,
Suite 9B, Century Ba-Shi Building,
398 Huai Hai Rd(M.),
Shanghai 200020,
China.
Tel: (56) 8621-63844603
Tel: (56) 8621-63844493
Fax: (56) 8621-6384-4025

DE

Cardinal Health,
Pascalstr. 2,
52499 Baesweiler,
Deutschland.
Tel: (49) 2401 604 0
Fax: (49) 2401 604 121

ES

Cardinal Health,
Avenida Valdeparra 27,
Edificio Alcor,
28108 - Alcobendas, Madrid, España.
Tel: (34) 91 657 20 31
Fax: (34) 91 657 20 42

FR

Cardinal Health,
Immeuble Antares - Technoparc,
2, rue Charles-Edouard Jeanneret.
78300 POISSY,
France.
Tél: (33) 1 30 06 74 60
Fax: (33) 1 39 11 48 34

GB

Cardinal Health,
The Crescent, Jays Close,
Basingstoke,
Hampshire, RG22 4BS,
United Kingdom.
Tel: (44) 0800 917 8776
Fax: (44) 1256 330 860

HU

Cardinal Health,
Döbrentei tér 1,
H-1013 Budapest,
Magyarország.
Tel: (36) 14 88 0232
Tel: (36) 14 88 0233
Fax: (36) 12 01 5987

IT

Cardinal Health,
Via Ticino 4,
50019 Sesto Fiorentino,
Firenze, Italia.
Tel: (39) 055 30 33 93 00
Fax: (39) 055 34 00 24

NL

Cardinal Health,
Kantorenpand "Hoefse Wing",
Printerweg, 11,
3821 AP Amersfoort,
Nederland.
Tel: (31) 33 455 51 00
Fax: (31) 33 455 51 01

NO

Cardinal Health,
Solbråveien 10 A,
1383 ASKER,
Norge.
Tel: (47) 66 98 76 00
Fax: (47) 66 98 76 01

NZ

Cardinal Health,
14 George Bourke Drive
Mt Wellington, Auckland
PO Box 14234
Panmure, Auckland
Tel: 09 270 2420
Freephone: 0508 422734
Fax: 09 270 6285

SE

Cardinal Health,
Hammarbacken 4B,
191 46 Sollentuna,
Sverige.
Tel: (46) 8 544 43 200
Fax: (46) 8 544 43 225

US

Cardinal Health,
10221 Wateridge Circle,
San Diego, CA 92121,
USA.
Tel: (1) 800 854 7128
Fax: (1) 858 458 6179

ZA

Cardinal Health,
Unit 2 Oude Molen Business Park,
Oude Molen Road, Ndabeni,
Cape Town 7405, South Africa.
Tel: (27) 860 597 572
Tel: (27) 21 510 7562
Fax: (27) 21 5107567

Appendix G

Document History

Document History

Issue	Date	CO No.	Author	Update Description
1	19/12/02	4091	Ian Tyler	Initial release
2	14/01/03	4268	Ian Tyler	RS232 pin-out table pin descriptions pin5 and 9 switched. Drug Protocol Setup table - Dose Rate Max & Min headings switched.
3	24/04/03	4432	Ian Tyler	Note added on cleaning with reference to shelf keypads. Added pole clamp pivot screw and changed one screw description. Added pole clamp arm and updated part numbers. Drawings of Pole clamp and Transducer to show latest versions.
4	10/06/04	4710	Ian Tyler	Information relating to Guardrails® Safety Software. Pole clamp arm replacement. Updates for latest Software versions, including - configuration options, part numbers, error codes and new screen display. Enhanced 2 piece syringe flange clamp. Adhesive feet availability information. Added additional diagrams for Chassis and Plunger assembly.
5	27/09/04	5478	Ian Tyler	Administration change.
6	6/04/05	5688	Ian Tyler	Add Alaris® PK Syringe Pump
7	20/04/05	5920	Ian Tyler	Add more information regarding battery calibration Updated TIVA Drug setup & protocol to include more units in column headings Add access code 612
8	4/11/05	6064	Ian Tyler	Update Speed test values New PK error codes Strain plate update New software settings Pole clamp part numbers update Rebranded from ALARIS Medical Systems to Cardinal Health Added access codes 175 & 711
9	23/06/06	6932	Ian Tyler	Administration rebrand change. Updated Motor Plate replacement instructions & drawings
10	01/07	7322	Ian Tyler	Update of Spare Parts